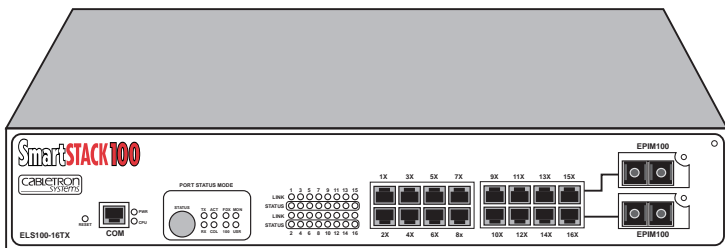


# SmartSTACK 100 ELS100-16TX USER GUIDE





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Equipment Type/Environment: **Networking Equipment, for use in a**  
**Commercial or Light Industrial**  
**Environment.**

We the undersigned, hereby declare, under our sole responsibility, that the equipment packaged with this notice conforms to the above directives.

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# CHAPTER 1

## INTRODUCTION

### 1.1 ABOUT THIS MANUAL

This manual is for system administrators responsible for configuring, monitoring, and maintaining the SmartSTACK 100 ELS100-16TX. You should have a familiarity with networking concepts and principles. In addition, a basic understanding of SNMP is helpful.

Some SmartSTACK 100 ELS100-16TX configurations can only be done using an SNMP-based Network Management System (NMS). Where applicable, this manual provides instructions for using the Local Console Manager (LCM) to perform basic configuration. Where it is not possible to use LCM, general instructions and guidelines applicable to most NMSs are provided.

The contents of each chapter are described below.

- Chapter 1, **Introduction**, outlines the contents of this manual and provides an overview of the SmartSTACK 100 ELS100-16TX's switching functions, applications, and the Local Console Manager (LCM).
- Chapter 2, **Unpacking and Installing Your ELS100-16TX**, describes the SmartSTACK 100 ELS100-16TX front and rear panels, how to install the SmartSTACK 100 ELS100-16TX, how to connect the Local Console Manager (LCM), and how to connect the ELS100-16TX to the network.
- Chapter 3, **Configuring Your ELS100-16TX**, provides instructions for configuring the SmartSTACK 100 ELS100-16TX using the Local Console Manager (LCM). It also provides some common Management Information Base (MIB) variables you may want to change.
- Chapter 4, **Monitoring and Managing Your ELS100-16TX**, describes how to monitor SmartSTACK 100 ELS100-16TX status and statistics. It also describes how to manage the SmartSTACK 100 ELS100-16TX Ethernet ports using the Local Console Manager (LCM).

- Chapter 5, **ELS100-16TX Diagnostics and Troubleshooting**, describes the SmartSTACK 100 ELS100-16TX diagnostics and provides information on troubleshooting common problems.
- Appendix A, **Technical Specifications**, provides the SmartSTACK 100 ELS100-16TX specifications and basic cabling pin assignments.
- Appendix B, **Glossary**, provides a glossary of terms both specific to the SmartSTACK 100 ELS100-16TX and common to the networking field.

1.2 GETTING HELP

For additional support related to this device or document, contact the Cabletron Systems Global Call Center:

Phone	(603) 332-9400
Internet mail	support@ctron.com
FTP Login Password	ctron.com (134.141.197.25) <i>anonymous</i> <i>your email address</i>
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Before calling the Cabletron Systems Global Call Center, have the following information ready:

- Your Cabletron Systems service contract number
- A description of the failure

- A description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)
- The serial and revision numbers of all involved Cabletron Systems products in the network
- A description of your network environment (layout, cable type, etc.)
- Network load and frame size at the time of trouble (if known)
- The device history (i.e., have you returned the device before, is this a recurring problem, etc.)
- Any previous Return Material Authorization (RMA) numbers

### 1.3 DOCUMENT CONVENTIONS

The following conventions are used throughout this document:

LCM commands, prompts, and information displayed by the computer appear in Courier typeface, for example:

```
Current Number of Learned Addresses: 133
```

Information that you enter appears in Courier bold typeface, for example:

```
ELS100-16 >status
```

Information that you need to enter with a command is enclosed in angle brackets < >. For example, you must enter a port number and an IP address to execute the `ipaddr` <port #> <IP address> command:

```
ELS100-16 >ipaddr 6 192.138.217.40
```

Field value options appear in bold typeface.

The following conventions are also used in this document:

**Note:** *Calls the reader's attention to any item of information that may be of special importance.*

**Tip:** *Conveys helpful hints concerning procedures or actions.*

**Caution:** *Contains information essential to avoid damage to the equipment.*

**Warning:** *Warns against an action that could result in equipment damage, personal injury or death.*



*Warns against an action that could result in equipment damage, personal injury or death.*

## 1.4 RELATED DOCUMENTATION

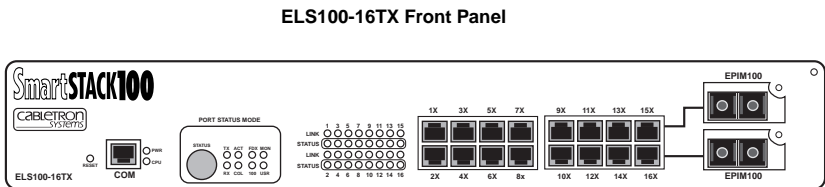
The following documentation may assist the user in using this product:

- *Getting Started with the SmartSTACK 100 ELS100-16TX* - contains the basic information for using the SmartSTACK 100 ELS100-16TX.
- *Interconnections, Bridges and Routers*, Radia Perlman, Addison Wesley © 1992.
- *Internetworking with TCP/IP: Principles, Protocols, and Architecture* (2nd edition), Volumes I and II, Douglas Comer, Prentice Hall © 1991.
- *The Simple Book, An Introduction to Management of TCP/IP-based internets*, Marshall T. Rose, Prentice Hall © Second Edition, 1994.

## 1.5 OVERVIEW

The SmartSTACK 100 ELS100-16TX is an intelligent Ethernet-to-Ethernet switch that is configured with 16 IEEE 802.3 10/100BASE-T autosensing Ethernet ports. The SmartSTACK 100 ELS100-16TX provides the option of substituting RJ45 ports 15 and 16 (either or both) with two EPIM ports. These ports accept the EPIM-100FX.

The ELS100-16TX also includes an RS232C port for out-of-band management. Figure 1-1 shows the front panel for the SmartSTACK 100 ELS100-16TX.



**Figure 1-1. SmartSTACK 100 ELS100-16TX Front Panel**

The SmartSTACK 100 ELS100-16TX

- Provides dedicated bandwidth for each network connected to its ports.
- Provides full store and forward bridging functionality and modified cut through operation.
- Provides complete error checking functionality.
- Provides port trunking to increase bandwidth.
- Provides port mirroring capability for enhanced troubleshooting.
- Supports Auto-negotiation.

- Operates in either Half Duplex or Full Duplex modes on all ports.
- Implements the Spanning Tree protocol (802.1d).
- Configured with factory-set defaults for immediate plug-and-play capability (IP address is not configured at factory).

In addition, the SmartSTACK 100 ELS100-16TX offers the following features that can help you manage and maintain your network:

- RMON support.
- Configuration and management using the Simple Network Management Protocol (SNMP) with either an in-band or out-of-band connection.
- Protection against broadcast/multicast storms.
- Ability to define virtual workgroups for more efficient bandwidth usage. The SmartSTACK 100 ELS100-16TX ports can be segmented into 8 separate broadcast domains.
- Compilation of statistics (by port) for traffic from each user device connected to a SmartSTACK 100 ELS100-16TX segment.

### **1.5.1 SmartSTACK 100 ELS100-16TX Architecture**

The SmartSTACK ELS100-16TX is a feature rich desktop switch supporting full wire speed throughput. The SmartSTACK ELS100-16TX brings enhanced performance and capabilities to workgroup and departmental networks by allowing the network administrator to configure the SmartSTACK ELS100-16TX to operate in a modified cut through mode that increases performance for larger packets.

The SmartSTACK ELS100-16TX supports 8192 MAC addresses and is compliant with the IEEE 802.1d Spanning Tree protocol. In addition, the SmartSTACK ELS100-16TX offers full address learning and filtering, while protecting against error propagation.



The SmartSTACK ELS100-16TX goes beyond switching basics incorporating unique management features, including, RMON statistics and Broadcast/multicast storm protection, proactive alarms, and both in-band and out-of-band SNMP management.

The SmartSTACK ELS100-16TX uses an ASIC-based switching engine with the flexibility and performance required for today's networking demands.

Ethernet switching allows customer to scale bandwidth by segmenting the network into smaller pieces providing the required amount of bandwidth to individual users or LAN segments. Ethernet switching protects the customer's investment in Ethernet network hardware by preserving installed shared LAN equipment such as repeaters and hubs, network interface cards, cabling, applications, and network operating systems, while re-deploying high-speed switches where necessary to support today's bandwidth demands.

The SmartSTACK ELS100-16TX will operate in either 10 Mbps half or full duplex or 100 Mbps half or full duplex modes. Utilization of Fast Ethernet 100 Mbps connections provides a 10 fold increase in data rate per segment while preserving the basic network operation and frame format.

The SmartSTACK 100 ELS100-16TX is protocol-transparent, meaning it can handle different types of network traffic regardless of the network protocol, such as IP and IPX. As the SmartSTACK 100 ELS100-16TX reads addresses from the packets it processes, it builds a dynamic database of addresses called the *Bridge Address Table*. In this way, the SmartSTACK 100 ELS100-16TX continuously learns the addresses of all connected devices. Consequently, you can add new devices to the network, change device addresses, and remove devices from the network without having to reconfigure the SmartSTACK 100 ELS100-16TX.

The Open System Interconnection (OSI) Reference Model, developed by the International Standards Organization (ISO), identifies the levels of functionality inherent in each of its seven layers. The SmartSTACK 100 ELS100-16TX operates at the Media

Access Control (MAC) sub-layer of the Data Link layer. Figure 1-2 shows the OSI Reference Model.

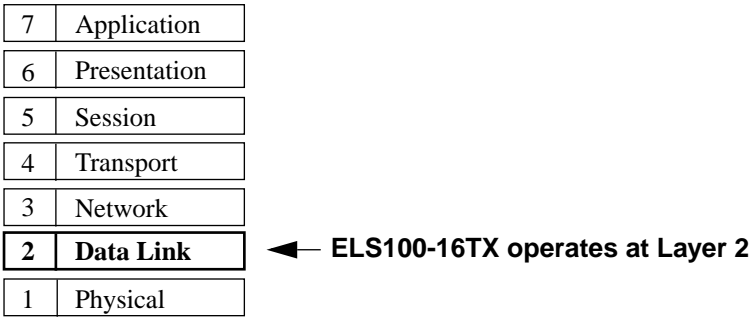


Figure 1-2. OSI Reference Model

## Port Trunking

Another performance enhancing feature of the SmartSTACK ELS100-16TX is Port Trunking. The SmartSTACK ELS100-16TX allows two Trunk groups of up to eight 10 Mbps or 100 Mbps ports to be connected between the SmartSTACK ELS100-16TX and network devices including Cabletron’s SmartStack 10, FastNET products and ATX LAN switch. This capability provides a scalable dedicated bandwidth in a single trunk group of up to 1.6 Gbps (full duplex) when using 100BaseX ports or 160Mbps (full duplex) when using the ports in 10BaseT mode. This is accomplished without introducing any emerging technologies such as Gigabit Ethernet or ATM. By connecting multiple SmartSTACK ELS100-16TX products using port trunking, the network administrator can create a virtual chassis (spanning multiple physical chassis), providing many-switched Ethernet and Fast Ethernet ports at a very low cost per port.

## Autonegotiation

Auto-negotiation is supported on all of the 16 switched Ethernet

ports allowing the switch port and an attached device to negotiate for full or half-duplex modes of operation. The SmartSTACK 100 ELS100-16TX also supports auto-negotiation as defined by IEEE 802.3u and will automatically set the port to the proper mode (10 Mbps, half/full duplex or, 100 Mbps half/full duplex). The EPIM100-FX interface will not support auto-negotiation, as auto negotiation for fiber is not defined in the 802.3u specification.

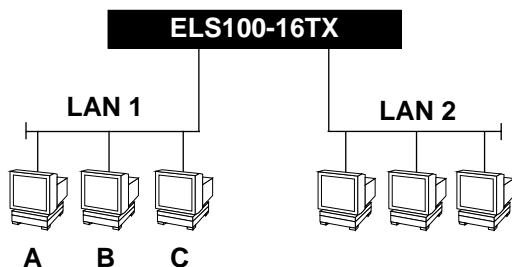
## Store and Forward Switching

As an intelligent Ethernet switch, the SmartSTACK 100 ELS100-16TX uses store and forward switching. Store and forward switching allows the SmartSTACK 100 ELS100-16TX to temporarily store packets until network resources, typically an unused link, are available for forwarding. This allows for complete error checking, and limits the amount of time between when a device requests access to the network and when it is granted permission to transmit. In addition, full store and forward switching ensures data integrity, thus preventing network error conditions from being generated throughout the network.

## Discarding Local Traffic

The SmartSTACK 100 ELS100-16TX checks all incoming packets for their destination address against the Bridge Address Table. If a packet's destination address is not on the same network segment as the originating packet, the SmartSTACK 100 ELS100-16TX forwards the packet to the network segment associated with that destination address, if known. However, if the packet's source and destination address are on the same network segment, known as *local traffic*, the packet is automatically discarded (i.e., ignored by the SmartSTACK 100 ELS100-16TX).

For example, a file transmitted from Workstation A to Workstation C in Figure 1-3 does not need to leave LAN 1. The SmartSTACK 100 ELS100-16TX connected to LANs 1 and 2 sees all traffic from LAN 1, including LAN 1 local traffic.



**Figure 1-3. Typical Switching Application**

By forwarding only packets addressed to devices on other network segments, the SmartSTACK 100 ELS100-16TX reduces unnecessary traffic and thereby enhances the overall performance of the network.

**Note:** *If the packet address is not found in the Bridge Address Table, it will be forwarded (flooded) to all network segments.*

## Spanning Tree Algorithm

The SmartSTACK 100 ELS100-16TX supports the IEEE 802.1d Spanning Tree algorithm. The Spanning Tree algorithm converts multiple LANs into a “spanning tree” of networks. It is used to prevent bridging loops. This standard defines a logical (not physical) network configuration consisting of one extended LAN without active duplicate paths between spanning tree bridges.

The SmartSTACK 100 ELS100-16TX, along with other IEEE 802.1d Spanning Tree compliant bridges in the network, dynamically configure the network topology into a single Spanning Tree by exchanging Bridge Protocol Data Units (BPDUs). Typically, each LAN segment is sent one BPDU every two seconds (this is the default setting).

When there are multiple SmartSTACK 100 ELS100-16TXs connecting LANs in a loop, the Spanning Tree algorithm determines which SmartSTACK 100 ELS100-16TX should forward

packets to the LAN. If there is a cable break or a port failure, the network topology is automatically reconfigured by the Spanning Tree protocol to create an alternate path to the LAN.

### **1.5.2 SmartSTACK 100 ELS100-16TX Bridge Address Table**

The SmartSTACK 100 ELS100-16TX creates and maintains a dynamic database of addresses called the Bridge Address Table. The SmartSTACK 100 ELS100-16TX examines every packet to determine its source address and LAN segment origin. It then compares the source address and segment information it finds to the entries in the Bridge Address Table.

If a packet's address is not already stored in the Bridge Address Table, the SmartSTACK 100 ELS100-16TX adds the learned address, associated segment number, and a timer value indicating the age of the observation. Consequently, the SmartSTACK 100 ELS100-16TX knows the address and associated segment number the next time it sees that address. By using the information stored in the Bridge Address Table, the SmartSTACK 100 ELS100-16TX is able to quickly forward each packet to the correct LAN segment.

The SmartSTACK 100 ELS100-16TX learns addresses from all packets, including data transmissions and "keep alive" packets (packets sent by an idle station to let other stations know it is present and functional). When devices are added to the network, removed from it, or relocated, you do not have to reconfigure the SmartSTACK 100 ELS100-16TX. The unit automatically learns new device addresses, recognizes when a previously used address is missing, or when a device has been moved to a new LAN segment.

An address stored in the Bridge Address Table is discarded if there is no subsequent activity from that address after a configured length of time (five minutes by default). This aging process ensures that the Bridge Address Table is continually updated.

Addresses are continually added to and deleted from the Bridge Address Table, reflecting the dynamic nature of internetwork traffic.

Each dynamic entry includes:

- An Ethernet MAC address
- A single port number of the LAN on which the address resides
- The age of the entry

The SmartSTACK 100 ELS100-16TX stores 8192 dynamic (learned) entries in its Bridge Address Table.

### **1.5.3 SmartSTACK 100 ELS100-16TX Port Mirroring**

Port monitoring allows the SmartSTACK 100 ELS100-16TX to redirect network traffic (good packets only) from multiple ports to the port selected for mirroring, in effect “mirroring” all network traffic to this port. This feature allows users who have existing investments in external analyzers, external RMON probes, or devices like Network General's Distributed Sniffer System™ to continue to receive expert analysis and packet decode functions in a switched environment -- simply use the port mirroring function to mirror switched traffic to the designated “diagnostic” port to which the analyzer is attached.

### **1.5.4 SmartSTACK 100 ELS100-16TX Sample Applications**

Just as a six lane highway allows you to travel much faster than a single lane highway, a network backbone creates high-speed connections for your network. In general, a network backbone allows you to distribute access to important network resources such as file or print servers. Additional SmartSTACK 100 ELS100-16TX features, such as trunking, Fast Ethernet, and virtual workgroups allow you to optimize bandwidth and design a more efficient flow for your network traffic.

## **SmartSTACK 100 ELS100-16TX Trunking**

The SmartSTACK 100 ELS100-16TX allows two trunk groups with up to eight ports each to be connected between the SmartSTACK 100 ELS100-16TX and other devices in the FastNetwork and SmartSTACK families. This capability provides a scalable dedicated bandwidth of up to 1.6 Gbps for 100 Mbps ports.

For example, local traffic, such as the Manufacturing Department's internal traffic, can be easily handled by a single, 10 Mbps connection. However, when the Manufacturing Department needs access to the corporate database, the traffic could travel over a trunk line, thereby increasing the speed of transmission.

Figure 1-4 illustrates the trunking of multiple SmartSTACK 100 ELS100-16TX ports to increase the bandwidth.

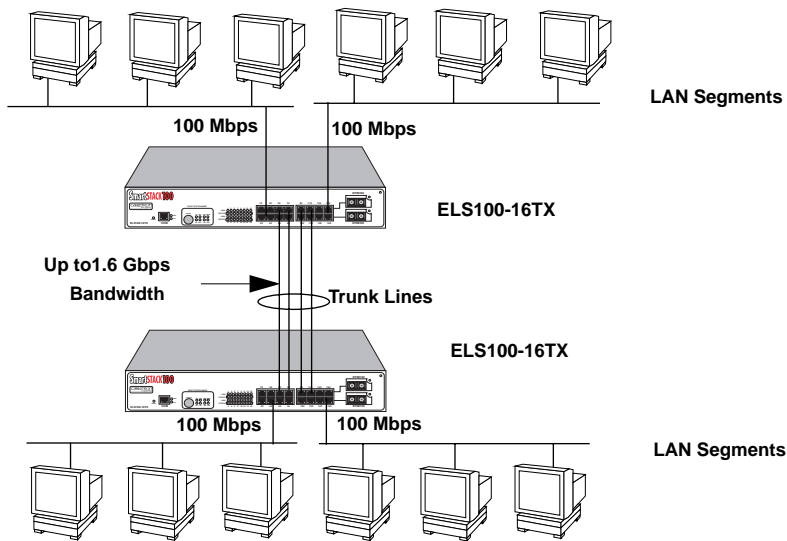


Figure 1-4. SmartSTACK 100 ELS100-16TX Trunking with 100 Mbps Ports

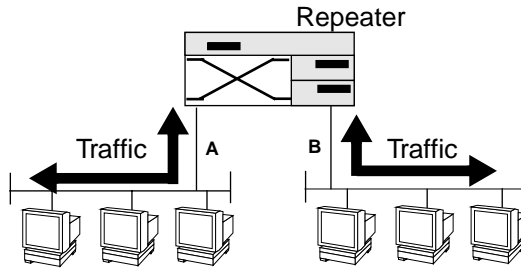
Virtual Workgroups

The SmartSTACK 100 ELS100-16TX allows you to define ports for logical groups of associated devices (virtual workgroups) to provide a more efficient flow of traffic across your Ethernet network. You can define a maximum of eight virtual workgroups.

Virtual workgroups offer you the ability to limit broadcasts to logical domains within the network. Workgroup destinations are recognized by the SmartSTACK 100 ELS100-16TX and broadcast packets are routed directly to hosts within the workgroup, eliminating the need to perform a general broadcast across each segment of the network to find specific host addresses.



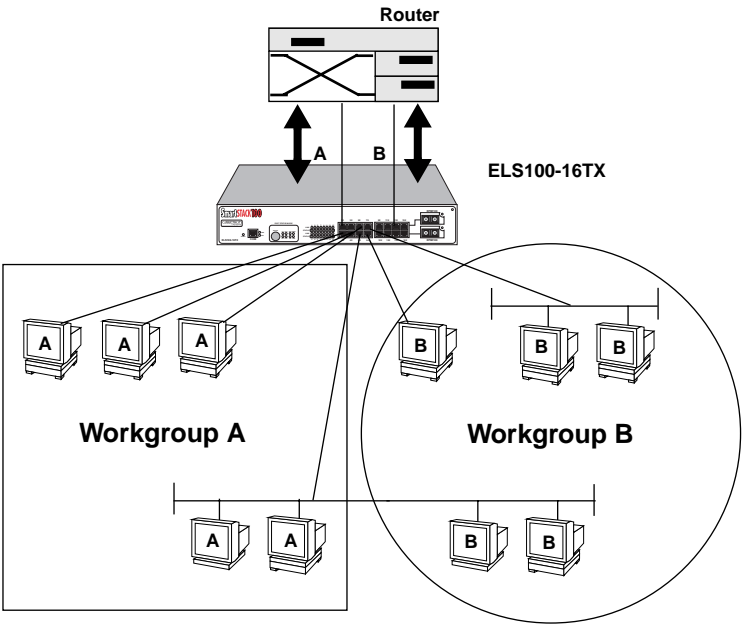
Figure 1-5 shows two Ethernet segments, A and B, that do not include a SmartSTACK 100 ELS100-16TX.



**Figure 1-5. Multiple Ethernet Segments Sharing 100 Mbps Bandwidth**

Each host on segments A and B is limited to sharing a network bandwidth of 10 Mbps.

Figure 1-6 shows two Ethernet segments that take advantage of the virtual workgroup feature of the SmartSTACK 100 ELS100-16TX and the increased bandwidth applied to each A and B host.



**Figure 1-6. Using the SmartSTACK 100 ELS100-16TX to Create Virtual Workgroups to Help Optimize Bandwidth**

A host from workgroup A can limit a broadcast to all hosts within workgroup A and prevent the broadcast from going across the network and adding to the amount of contention for the limited 100 Mbps bandwidth.

Ports that are not part of a workgroup will receive and transmit packets from any ports. However, if you configure the SmartSTACK 100 ELS100-16TX with workgroup A and B, as shown in Figure 1-6, broadcast traffic from workgroup A ports will not be seen on workgroup B ports, and vice versa.

As illustrated in the previous diagram, virtual workgroups allow you to associate multiple ports and define a workgroup. In reality, you are assigning workgroup IDs to SmartSTACK 100 ELS100-16TX ports.

## 1.6 LOCAL CONSOLE MANAGER

The Local Console Manager (LCM) is a command-line interface built into the SmartSTACK 100 ELS100-16TX. The LCM enables you to monitor, manage, and configure the SmartSTACK 100 ELS100-16TX through the out-of-band RS232C connection attached to any non-intelligent terminal or workstation running terminal emulation.

You can also use a Cabletron Systems Network Management System, or a standard SNMP-based Network Management System, to manage the SmartSTACK 100 ELS100-16TX. For a list of available SmartSTACK 100 ELS100-16TX network management tools, see Section 4.1, **ELS100-16TX Management Tools**.

The following sections describe LCM command syntax and the basic LCM commands for logging in, logging out, and getting help.

- LCM commands used for configuring the SmartSTACK 100 ELS100-16TX are described in Chapter 3, **Configuring Your ELS100-16TX**.
- LCM commands used for monitoring and managing the SmartSTACK 100 ELS100-16TX are described in Chapter 4, **Monitoring and Managing Your ELS100-16TX**.

**Note:** The *Getting Started with the SmartSTACK 100 ELS100-16TX* guide lists the available LCM commands, including each command's options.

## 1.6.1 Command Syntax Conventions

The following conventions apply as you use LCM commands:

- Press the **Enter** key to execute a command after you type it in.
- A **port range** is either a single port number, or a list of port numbers separated by commas or hyphens. For example, 3 is port 3; 3,7 are ports 3 and 7; 3-5 are ports 3,4, and 5; and 3-5,7 are ports 3,4,5, and 7.
- To quit any command, press the Control-C keys (^C or Ctrl-C).
- You can abbreviate any command where there is no ambiguity; if there is ambiguity, LCM responds with an error message.
- Commands are not case sensitive.
- Invalid commands or misspellings returns an error message.
- The previous command can be repeated by typing **!!**
- MAC addresses are displayed in little-endian Ethernet (least significant bit) bit order, with each octet separated by a colon. For example:

```
ELS100-16 >address 00:40:27:04:1a:0f
```

- Information that you need to enter with an LCM command is enclosed in square brackets [ ]. For example, you must enter a port number and an IP address to execute the `ipaddr [PORT-NUMBER] [IP ADDRESS] command`:

```
ELS100-16 >ipaddr 6 192.138.217.40
```

- Parameters that appear in all capital letters, for example `bridge [PORT-RANGE]`, indicate that you must enter a value for that parameter. If a string of parameters is displayed between braces, for example `[{off|on|noBPDU}]`, you must select one of the displayed options. For example, if you wanted to enable bridging on a port, or a range of ports, you would enter:

```
ELS100-16 >bridge 2-4 on
```

## **1.6.2 Basic LCM Commands**

If you are going to manage the SmartSTACK 100 ELS100-16TX using LCM, you first must connect the SmartSTACK 100 ELS100-16TX to an ASCII terminal or terminal emulator. See Section 2.5, **Connecting the Local Console Manager**, for instructions.

When you want to use LCM, begin by pressing the **Enter** key several times to get the LCM prompt (ELS100-16TX >).

### **Help**

Displays the menu of available commands. Help can also be displayed by typing a question mark (?). The output from the `help` command is displayed follows.

ELS100-16 > **help**

### ELS100-16TX Local Console Manager

help or ?	this menu
status [PORT-RANGE]	to display unit or port status
baud [BAUD-RATE]	to change the console baud rate
exit or logout	to logout
erase	to erase configuration information
ident	to display unit identification
ipaddr [PORT# IPADDR [MASK]]	to set or display IP addresses
addresses display [any] [ADDR [MASK]]	to display learned addresses
bridge [PORT-RANGE [OPTIONS]]	to set bridging methods
clearstats	to clear all port statistics
trunk [PORT-RANGE [{on off}]]	to set or display trunking status
enable [PORT-RANGE [noRIP]]	to enable a set of ports
disable [PORT-RANGE]	to disable a set of ports
community	to change the password/community name
sttimer [TIMER-VALUE]	to set or display st age timer
workgroup [NAME [delete PORT-RANGE [INFO]]]	to set or display workgroups
speed [PORT-RANGE [{auto 10 100}]]	to set or display speed
duplex [PORT-RANGE [{auto half full}]]	to set or display duplex mode
mirror [PORT# {Rx Tx both off}]	to set or display port mirroring
time [SystemTime (HHMMSS)]	to set or display the system time
date [SystemDate (MMDDYYYY)]	to set or display the system date
reboot (SECONDS off)	to reboot the unit after seconds
arp display	to display the arp table
route display [IPADDR]	to display routing table information
ping [-rvsx] HOST [DATASIZE [COUNT]]	to send ICMP ECHO_REQUEST pkts to tgt
traplog	to display the most recent SNMP traps

ELS100-16 >

## Erase

Entering **erase** to erase the current SmartSTACK 100 ELS100-16TX configuration returns all parameters to the default values.

## Exit or Logout

Logs you out of LCM. (The **exit** command is functionally equivalent to the **logout** command.)

## Traplog

Displays the traps messages captured by the SmartSTACK 100 ELS100-16TX. The following is an example of a traplog display:

```
ELS100-16> traplog
Trap 16 0:00:00
    The unit has booted.
Trap 25 0:00:00
    The unit's spanning tree maximum age has changed.
Trap 26 0:00:00
    The unit's spanning tree hello time has changed.
Trap 27 0:00:00
    The unit's spanning tree forward delay times has changed.
Trap 3 0:00:02 port 1
    The current functional state of the port has changed.
    .
    :
    .
ELS100-16>
```





## CHAPTER 2

### UNPACKING AND INSTALLING YOUR ELS100-16TX

Carefully unpack the ELS100-16TX from the shipping carton and inspect it for possible damage. If any damage is evident, contact your supplier. The shipping carton contains the following:

- The ELS100-16TX unit
- One AC power cord
- Console Cable kit
- Two rack-mounting brackets with fasteners (for rack-mount installation)
- Documentation – In addition to this manual, the *Getting Started with the SmartSTACK 100 ELS100-16TX* guide, and Release Notes are also included.



Only qualified personnel should perform installation procedures.

#### 2.1 ELS100-16TX FRONT PANEL

The ELS100-16TX provides 16 IEEE 802.3 10/100 BASE-T autosensing Ethernet ports. The ELS100-16TX provides the option of substituting ports RJ45 ports 15 and 16 (either or both) with two EPIM ports. These ports accept the EPIM-100FX.

Each ELS100-16TX also includes an RS232C port for out-of-band management. Figure 2-1 shows the ELS100-16TX's front panel. The LEDs and buttons are described in Tables 2-1 and 2-2.

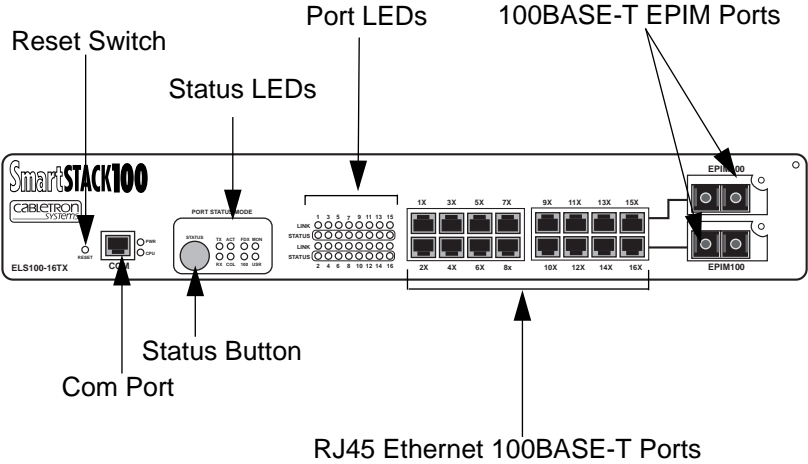


Figure 2-1. ELS100-16TX Front Panel

**Table 2-1. Meaning of ELS100-16TX LEDs**

LED	State	Meaning
Port Status Mode		
TX	On	Indicates port is transmitting a packet.
RX	On	Indicates port is receiving a packet.
ACT	On	Indicates port is transmitting or receiving.
COL	On	Indicates a collision on a port.
FDX	On	Port is operating in Full Duplex.
	Off	Port is operating in Half Duplex.
100	On	Port operating at 100 Mbps.
	Off	Port operating at 10 Mbps.
MON	On	Indicates the monitor port.
	Blink	Indicates the port(s) being monitored.
USR	On	Indicates that errored packets were received.
Link (Individual Ports)	On	Indicates the link is good.
	Off	Indicates there is no link.
Status (Individual Ports)	On/ Blink	Indicates you are monitoring the port for a selected segment status condition. This LED always indicates the selected status mode.
CPU	On	Indicates the ELS100-16TX is operational.
	Blinking	Indicates the ELS100-16TX is running power-up diagnostics.
	Off	Indicates the ELS100-16TX is non-operational.
Pwr	On	On – Indicates the ELS100-16TX is receiving power and the voltage is within the acceptable range.
	Off	Indicates the ELS100-16TX is not receiving power.

Table 2-2 describes the ELS100-16TX buttons.

**Table 2-2. Description of ELS100-16TX Buttons**

Button	Function
Status	Cycles through the Segment Status options (TX, RX, Act, Col, FDX, 100, MON, and Usr) for all ports. The right-hand port status LEDs of the ports you are monitoring are activated based on what function you chose with the Select button.
Reset	Restarts the ELS100-16TX.

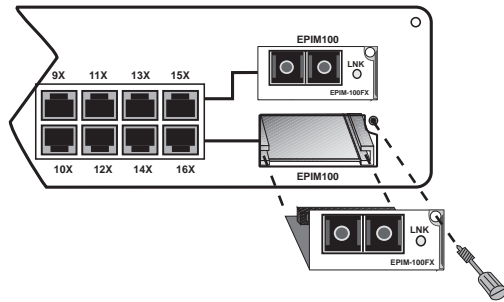
**2.2 INSTALLING AN EPIM**

The ELS100-16TX provides two slots for a Cabletron EPIM-100FX (Ethernet Port Interface Module). The ELS100-16TX is shipped without EPIMs. To install an EPIM, follow the procedure below:

1. Remove the coverplate or the existing EPIM (whichever applies).
2. Slide the new EPIM into place, making sure that the connectors on the rear of the EPIM align correctly and firmly with the connector inside the ELS100-16TX.  
Refer to Figure 2-2.
3. Install the mounting screw.

**Caution:** When removing an EPIM, pull the module straight out to prevent damage to the connector.

**Note:** The EPIM is hot swappable. Also, the RJ45 port corresponding to the EPIM port is disabled once an EPIM is installed.



**Figure 2-2. Installing an EPIM**

## 2.3 INSTALLING THE ELS100-16TX

### Rack-Mounting an ELS100-16TX

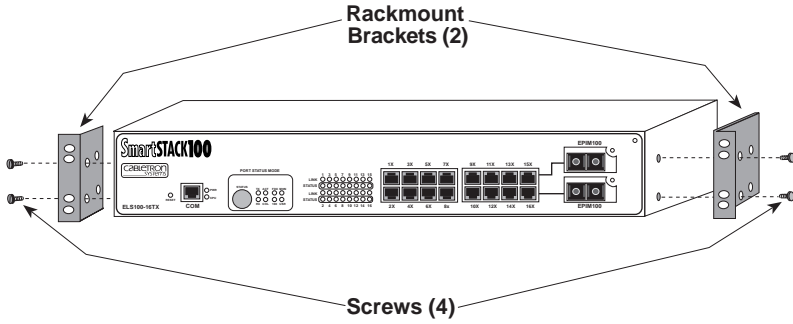
Table 2-3 describes some general considerations you should be aware of before mounting an ELS100-16TX in a rack assembly.

**Table 2-3. General Considerations for Mounting an ELS100-16TX**

Consideration	Discussion
Temperature	Since the temperature within a rack assembly may be higher than the ambient room temperature, make sure the rack environment temperature is within the Operating Temperature range specified in Appendix A.
Air Flow	Make sure there is at least 2 inches (or more) on both sides of the ELS100-16TX to allow for adequate air flow.
Mechanical Loading	Do not place equipment on top of a rack-mounted ELS100-16TX.
Circuit Overloading	Make sure the power supply circuit to the rack assembly is not overloaded.
Grounding (Earthing)	Rack-mounted equipment should be grounded. In addition to the direct connections to the main power supplies, make sure all the other supply connections are also grounded.

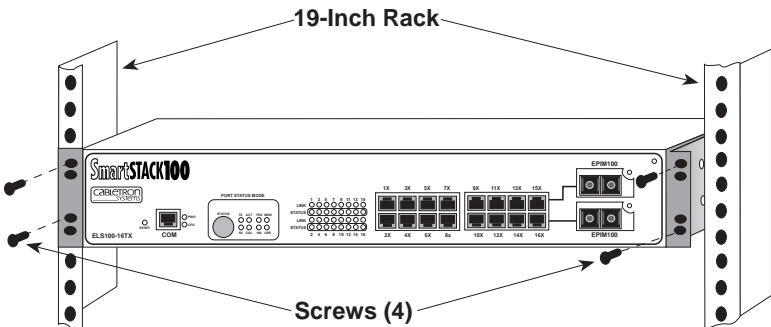
The ELS100-16TX can be rack-mounted in a standard 19-inch equipment cabinet. To mount the ELS100-16TX in a rack assembly, apply the following steps:

1. Attach the rackmount brackets to either side of the ELS100-16TX chassis, as shown in Figure 2-3.



**Figure 2-3. Attaching Rackmount Brackets**

2. Place the ELS100-16TX chassis in the cabinet.
3. Secure the ELS100-16TX with the rackmount fasteners by inserting and securing a fastener through each of the four slots in the rackmount brackets, as shown in Figure 2-4.



**Figure 2-4. Rack-mounting the ELS100-16TX**

4. Once the ELS100-16TX is installed, plug the AC power cord into the AC power connector on the rear of the ELS100-16TX chassis. Plug the other end of the power cord into a three-prong grounded outlet.

## 2.4 CHECKING THE POWER-UP DIAGNOSTICS SEQUENCE

Before connecting any devices to the ELS100-16TX, power on the unit and observe the power-up diagnostics sequence to check for proper operation.

To observe the power-up diagnostics sequence completely, you may want to repeat it. To restart the power-up sequence, press the reset button on the front panel.

When you power up the ELS100-16TX, the following occurs:

1. The Power (Pwr) LED is on.
2. The CPU LED starts flashing. Two of the Port Status Mode LEDs are on.
3. After several seconds, the CPU LED will stay on and only one Port Status LED is lit. This indicates the power-up diagnostics sequence is complete.

**Note:** *If a critical component fails diagnostics, the CPU LED will turn off and the ELS100-16TX will attempt to reboot. If the CPU LED does not stay on, contact the Cabletron Systems Global Call Center. Refer to Section 1.2.*

## 2.5 CONNECTING THE LOCAL CONSOLE MANAGER

The Local Console Manager (LCM) is a command-line interface for configuring, monitoring, and managing the ELS100-16TX through the out-of-band RS232C connection on the front panel.



To connect the LCM:

1. Connect your ASCII terminal or terminal emulator to the out-of-band management RS232C port on the front panel of the ELS100-16TX using the standard RJ-45 twisted pair cable shipped with the unit. (Only three wires are necessary: Receive Data, Transmit Data and Ground.)
2. Set the terminal to 9600 baud, 8N1: 8 data bits, 1 stop bit, no parity, and no flow control.
3. Press the **Enter** key several times. If the ELS100-16TX and terminal are operational, LCM responds with the `ELS100-16TX >` prompt.
4. LCM is now ready to use.

Refer to Section 1.6, **Local Console Manager**, for a general overview of LCM and the command syntax. LCM commands for configuring, monitoring, and managing the ELS100-16TX are provided in the chapters dealing with those topics.

## **2.6 CONNECTING TO THE NETWORK**

This section provides the procedures for connecting UTP and multimode fiber optic segments from the network or other devices to the ELS100-16TX.

The ELS100-16TX is configured with 16 IEEE 802.3 10/100 BASE-T autosensing RJ45 Ethernet ports. The ELS100-16TX provides the option of substituting RJ45 ports 15 and 16 (either or both) with two EPIM ports. These ports accept the EPIM-100FX, which have SC style MMF connectors.

Refer to Section 2.6.1 to make UTP connections.

Refer to Section 2.6.2 to make a fiber optic connection to an EPIM-100FX.

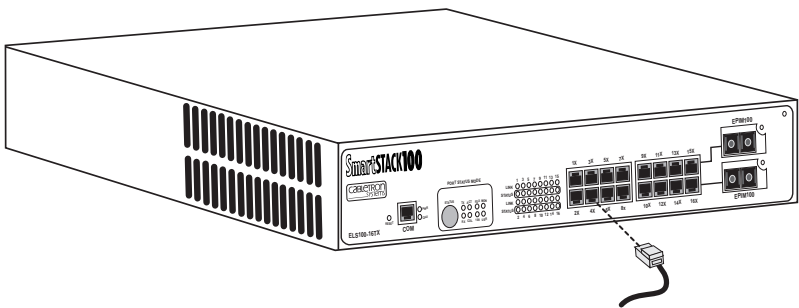
## 2.6.1 Connecting UTP Cables

Before connecting a segment to the ELS100-16TX, check each end of the segment to verify wire crossover.

**Caution:** *To establish a link, you must have an odd number of crossovers (preferably one) between 10/100 BASE-T devices of the same type (i.e., from repeater to repeater or transceiver to transceiver).*

Connect a twisted pair segment to the ELS100-16TX as follows:

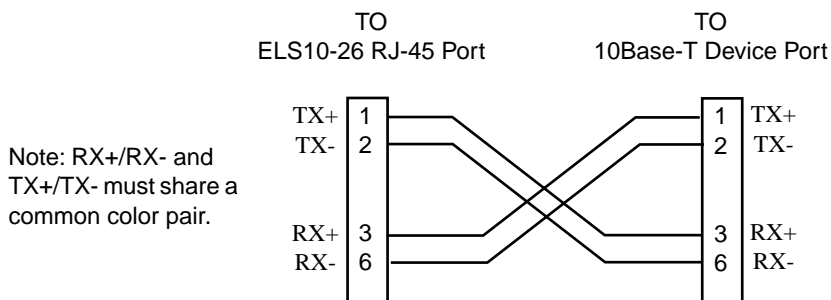
1. Ensure that the device at the other end of the segment is connected to the segment and is powered ON.
2. Refer to Figure 2-5. Connect the twisted pair segment to the ELS100-16TX by inserting the RJ45 connector on the twisted pair segment into the desired RJ45 port.



**Figure 2-5. ELS100-16TX Twisted Pair Connection**

3. Verify that a Link exists by checking that the port **LINK** LED is on (solid green). If the **LINK** LED is off, perform the following steps until it is on:
  - a. Check that the 10/100 BASE-T device at the other end of the twisted pair segment is ON and connected to the segment.

- b. Verify that the RJ45 connectors on the twisted pair segment have the proper pinouts (Figure 2-6) and check the cable for continuity.



**Figure 2-6. Cable Pinouts - (RJ45) Crossover Cable**

- c. Check that the twisted pair connection meets the dB loss and cable specifications.

If a link is not established, contact Cabletron Systems Global Call Center. Refer to Section 1.2, **Getting Help**, for details.

4. Repeat step 2, above, until all connections have been made.

## 2.6.2 Connecting a Segment to the EPIM-100FX

The EPIM-100FX has an SC style network port. Cabletron Systems supplies fiber optic cable that uses SC style connectors that are keyed to ensure proper crossing over of the transmit and receive fibers.

**Caution:** *An odd number of crossovers (preferably one) must be maintained between devices so that the transmit port of one device is connected to the receive port of the other device and vice versa.*

*If the fiber optic cable being used has SC style connectors that do not resemble MIC style connectors, or has SC connectors on one end and a different type on the other, such as ST connectors, ensure that the proper crossing over occurs.*

## Fiber Optic Network Connection

1. Remove the protective plastic covers from the fiber optic ports on the applicable port on the module and from the ends of the connectors.

**Caution:** *Do not touch the ends of the fiber optic strands, and do not let the ends come in contact with dust, dirt, or other contaminants. Contamination of the ends causes problems in data transmissions. If the ends become contaminated, clean them with alcohol using a soft, clean, lint-free cloth.*

2. Insert one end of the SC connector into the EPIM-100FX installed in the ELS100-16TX. See Figure 2-7.
3. At the other end of the fiber optic cable, attach the SC connector to the other device.

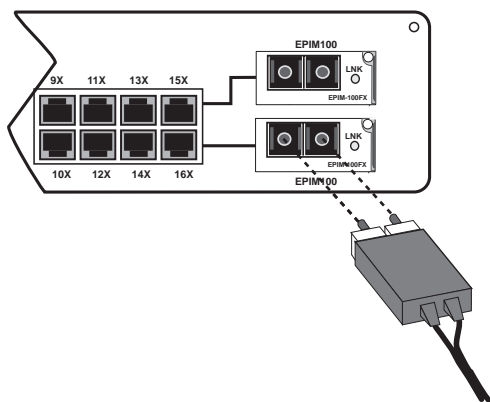


Figure 2-7. EPIM-100FX Port

4. Verify that a Link exists by checking that the port **LINK** LED is solid green. If the **LINK** LED is off, perform the following steps until it is on:
  - a. Check that the power is turned on for the device at the other end of the Link.
  - b. Verify proper crossing over of fiber strands between the applicable port on the ELS100-16TX and the fiber optic device at the other end of the fiber optic link segment.
  - c. Verify that the fiber connection meets the dB loss specifications.

If a Link has not been established, contact Cabletron Systems Global Call Center. Refer to Section 1.2, **Getting Help**, for details.

The ELS100-16TX is now ready to be set up through Local Management. Refer to Chapter 4, **Monitoring and Managing Your ELS100-16TX**, to configure the ELS100-16TX.



## CHAPTER 3

### CONFIGURING YOUR ELS100-16TX

The ELS100-16TX does not require any additional configuration to operate as a standard, transparent switch. However, if you want to use any of the ELS100-16TX advanced functions, you must first assign an IP (Internet Protocol) address to any of the ports on the ELS100-16TX that you use to communicate with a Simple Network Management Protocol (SNMP) manager.

To initially assign an IP address, you can use the Local Console Manager (LCM). LCM is a command-line interface built into the ELS100-16TX. It allows you to configure and manage the ELS100-16TX through the out-of-band RS232C connection attached to any non-intelligent terminal, or a PC emulating a non-intelligent terminal. (See Section 3.1, **Assigning IP Addresses**.)

Once you have assigned an IP address, you can use any of the following network management tools to configure and manage the ELS100-16TX:

- SPECTRUM
- SPEL
- SPMA
- Any SNMP-based NMS

Configuration parameters are stored in an SNMP standard Management Information Base (MIB). All ELS100-16TX MIB variables are listed and described in the ELS100-16TX Release Notes.

**Note:** *There are some configuration options that cannot be configured using LCM commands. You may need to modify your configuration using an NMS. See Section 3.14, **Modifying MIB Variables**.*

The following sections describe how to configure the optional parameters of the ELS100-16TX using LCM commands, including:

- Assigning IP addresses
- Enabling and disabling bridging
- Displaying bridging functions
- Enabling and disabling trunking
- Displaying trunking status
- Defining and deleting virtual workgroups
- Assigning a community name

**Note:** You can use the LCM *erase* command to erase all configuration information and return the unit to default settings on the next system reset. The *erase* command also clears any IP addresses.

*If you are using a network management tool other than LCM, refer to its accompanying documentation.*

### 3.1 ASSIGNING IP ADDRESSES

You can assign an IP to each port, or you can assign one address that can be used for the the entire device. Addresses for each port must be unique. IP addresses are divided into classes based on what portion of the address is network or port information. The address classes are A, B, and C.

- Class A addresses are used in very large networks that support many ports. The first byte identifies the network and the other three bytes identify the node. The first byte of a class A address must be in the range 1–126. The address 100.125.110.10 would identify node 125.110.10 on network 100.



- Class B addresses are used for medium sized networks. The first two bytes identify the network and the last two identify the node. The first byte of a class B address must be in the range 128–191. The address 128.150.50.10 identifies node 50.10 on network 128.150.
- Class C addresses are used for small networks. The first three bytes identify the network and the last byte identifies the node. The first byte of a class C address must be in the range 192–223. The address 192.138.217.10 identifies node 10 on network 192.138.217.

To assign an IP address to a port, at the LCM prompt:

1. Type `ipaddr <PORT-NUMBER> <IP ADDRESS>`

For example, `ipaddr 6 192.138.217.40` would set the IP address of Port 6 to 192.138.217.40. LCM responds by displaying the IP address table, as shown under the `ipaddr` command.

### 3.1.1 Displaying IP Addresses

To display IP addresses, subnet masks, and MAC addresses of all ports on the ELS100-16TX you are configuring, at the LCM prompt:

- 1. Type `ipaddr`

LCM displays the current IP address table, for example:

Port	IP Address	Address Mask	MAC Address
1	192.138.217.1	255.255.255.0	00:40:27:00:06:1f
2	0.0.0.0	255.0.0.0	00:40:27:00:06:c3
3	192.138.217.10	255.255.255.0	00:40:27:00:06:3e
4	0.0.0.0	255.0.0.0	00:40:27:00:03:7a
5	0.0.0.0	255.0.0.0	00:40:27:00:05:c7
6	192.138.217.20	255.255.255.0	00:40:27:00:04:4a
7	192.138.217.50	255.255.255.0	00:40:27:00:06:9e
.			
.			
.			
16	192.138.217.30	255.255.255.0	00:40:27:00:04:b4

### 3.1.2 Deleting an IP Address

To delete an IP address, at the LCM prompt:

- 1. Type `ipaddr <PORT-NUMBER> 0.0.0.0`

LCM responds by redisplaying the current IP address table.

### 3.1.3 Changing a Subnet Mask

You can optionally set the subnet mask for a port. A subnet mask is a 32-bit address mask used in IP to specify a particular subnet. If the subnet mask is 0.0.0.0, the ELS100-16TX will automatically convert the displayed mask to the standard default, based on the port's IP address class. (Class A address masks are 255.0.0.0, Class B address masks are 255.255.0.0, Class C address masks are 255.255.255.0.)

To change the subnet mask, at the LCM prompt:

1. Type `ipaddr <PORT-NUMBER> <IP ADDRESS> <SUBNET MASK>`

For example, `ipaddr 6 192.138.217.40 255.255.240.0` would set the subnet mask for port 6 to 255.255.240.0. LCM responds by redisplaying the current address table.

**Note:** *When you change the subnet mask for a port, you must also enter the IP address for that port. Make sure you enter the IP address for the port correctly; whatever you enter becomes the IP address for that port.*

## 3.2 ENABLING BRIDGING

The LCM `bridge` command allows you to set bridging options for a single port or a range of ports. The options include:

- off
- on (the default with BPDU enabled)
- noBPDU

BPDU (Bridge Protocol Data Unit) is a data unit transmitted as part of the IEEE 802.1d Spanning Tree protocol. The exchange of BPDUs allows bridges within a network to logically configure the network as a single spanning tree.

**Note:** *Selecting the **noBPDU** option could make your network inoperable because the ELS100-16TX would be unable to detect loops.*

Using LCM to enable bridging for a port or port range, at the LCM prompt:

1. Type `bridge [PORT-RANGE] [{off|on|noBPDU}]`

For example, `bridge 2 on` would enable bridging on port 2.

LCM responds:

```
Port 2 bridging: Transparent Bridging
```

### 3.3 DISABLING BRIDGING

To turn off the bridging function for a port or port range, at the LCM prompt:

1. Type `bridge [PORT-RANGE] off`

For example, `bridge 2 off` would disable bridging on port 2.

LCM responds:

```
Port 2 bridging: Off
```

### 3.4 DISPLAYING BRIDGING FUNCTIONS

To display the bridging functions that are enabled for all ports, at the LCM prompt:

1. Type `bridge`

LCM responds with a list of all ports and the bridging function that is enabled. For example, typing `bridge` would display the bridging status for all ports.

```
Usage: bridge [PORT-RANGE [{off|on|noBPDU}]]  
Port 1 bridging: Transparent Bridging  
Port 2 bridging: Transparent Bridging  
Port 3 bridging: Transparent Bridging  
Port 4 bridging: Transparent Bridging  
      ⋮  
Port 16 bridging: off
```

You could also type `bridge [PORT-RANGE]` to look at a specific range of ports. For example `bridge 2-4` would display bridging functions for ports 2, 3, and 4.

### 3.5 ENABLING TRUNKING

If your network configuration requires you to connect two or more ELS100-16TXs (or other devices capable of trunking) together, but the applications you are running over the network require more than 100 Mbps of bandwidth per connection, you can use the built-in trunking feature to increase bandwidth up to 1.6 Gbps, without installing additional hardware on your network.

Trunking is a Cabletron Systems proprietary extension to the 802.1d Spanning Tree algorithm. It enables you to use multiple 100BASE-T Ethernet segments to connect ELS100-16TXs together, while maintaining first-in, first-out ordering of Ethernet packets. In addition, if any of the Ethernet segments configured for trunking become inoperable, those Ethernet segments are automatically bypassed.

Figure 3-1 shows two ELS100-16TXs connected by four 100BASE-T crossover cables. You can connect up to eight ports for sharing the traffic load. Any additional connected ports will become *standby* ports. The connections must be point-to-point. That is, there cannot be any other devices on the Ethernet segments.

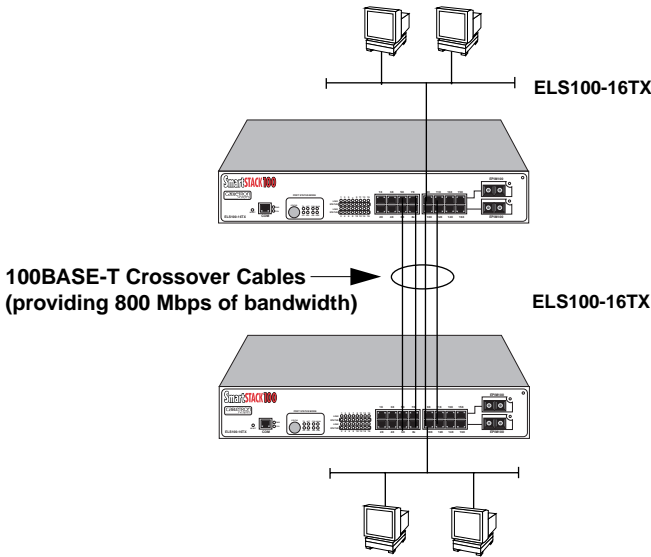


Figure 3-1. Trunk Connections

## Trunk Groups

Each set of connections between two ELS100-16TXs is called a *Trunk Group*. You can create up to eight trunk groups, each with up to eight ports, to interconnect your ELS100-16TXs.

For example, if you have three ELS100-16TXs (A, B, and C), as shown in Figure 3-2, you could connect them using a single Ethernet segment. However, that would limit the interconnection to 100 Mbps. To solve this problem, you could connect **A to B** with one Trunk Group, and connect **B to C** with a second Trunk Group.

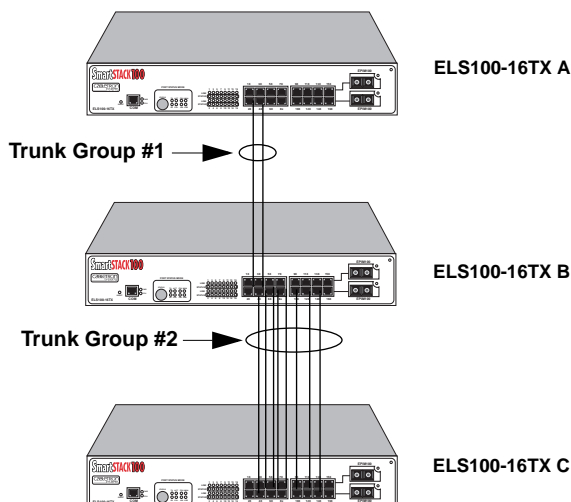


Figure 3-2. Trunk Groups

To enable trunking for the example shown, perform the following:

1. Connect the desired ports of the ELS100-16TXs together using 100BASE-T crossover cables.

If ELS100-16TX A is handling only a small number of users, the **A to B** Trunk Group could have just two ports per ELS100-16TX. If ELS100-16TX B and C are expected to interconnect many users, you could use up to eight ports in the **B to C** Trunk Group.

2. Using LCM or an NMS, turn on trunking for the connected ports on each ELS100-16TX.

For ELS100-16TX A, at the LCM prompt:

- a. Type `trunk 2,3 on`

For ELS100-16TX B, at the LCM prompt:

b. Type `trunk 3-10,14-15 on`

For ELS100-16TX C, at the LCM prompt:

c. Type `trunk 3-10 on`

Each ELS100-16TX determines which ports are part of which Trunk Group. After Trunk Group configuration, the ELS100-16TXs complete the standard 802.1d Spanning Tree state changes, treating each Trunk Group as a single 802.1d Spanning Tree port.

802.1d Spanning Tree takes about thirty seconds to resolve which ELS100-16TX ports are to become forwarding ports. As ports within a Trunk Group become forwarding ports, traffic within the Trunk Group is momentarily halted to guarantee the first-in, first-out ordering of the Ethernet packets.

**Note:** *The ELS100-16TX-to-ELS100-16TX connections must be point-to-point. There cannot be any other devices on those Ethernets. The ports used for trunking can be in any order. However, both ends of the ELS100-16TX-to-ELS100-16TX connections must have trunking turned on for the ports that are being used for the connections.*

## 3.6 DISABLING TRUNKING

To turn off trunking, at the LCM prompt:

1. Type `trunk <PORT-RANGE> off`

For example, `trunk 2-4 off`



### 3.7 DISPLAYING TRUNKING STATUS

To check the status of your current trunking configuration, at the LCM prompt:

1. Type `trunk <PORT-RANGE>`

The display could look like the following:

***Note:*** IP Addresses are not required for trunking to function.

```
ELS100-16 > trunk 2-4
```

```
Port 2 trunking joined to Bridge MAC Addr 00:40:27:00:06:1f IP Addr 192.138.217.1
Port 3 trunking joined to Bridge MAC Addr 00:40:27:00:06:c3 IP Addr 192.138.200.2
Port 4 trunking joined to Bridge MAC Addr 00:50:36:00:07:4a IP Addr 192.140.250.7
```

To check the status for ports configured for trunking, at the LCM prompt:

1. Type `status <PORT-RANGE>`

The display could look like the following:

```
ELS100-16 > status 1

      Port 1 Status
Type/Speed:          10B-TPX/10Mbits
Port Mirroring:      No
Duplex Mode:         Half Duplex
Bridging:            Transparent Bridging
Enabled/Disabled:    Enabled, Rip listening
Spanning Tree:       Forwarding
Trunking State:       Off
Pkts Transmitted:    1693
Pkts Received:       0
Carrier Losses:      1693
Total Collisions:    0
Excess Collisions:   0
RX Missed pkts:      0
RX Runt pkts:        0
RX FCS/Align Errs:   0
Internal TX Errs:    0

Type <CR> to display port 2 status...>
```

The following conditions can be displayed:

- Broken — Trunking is enabled, but the port is non-operational.
- Closed (or Oneway) — Trunking is enabled, and the Trunking Protocol is attempting to establish a trunk connection.
- Helddown — Trunking is enabled, but the trunk connection was rejected. After a short time-out period, another attempt is automatically initiated to establish a good trunk connection.
- Joined — Trunking is enabled, and the Trunking Protocol has established a good trunk connection.
- Off — Trunking is not enabled.

- **Perturbed** — Trunking is enabled, and a good trunk connection has been established. However, the forwarding of data packets is temporarily suspended to allow for a change in the membership of the Trunk Group.

### 3.8 ENABLING PORT MIRRORING

The ELS100-16TX allows you to mirror the 10/100BASE-T ports on the ELS100-16TX. The mirroring of network traffic is performed by the ELS100-16TX hardware, and the mirror image reflects only good packets. The ELS100-16TX mirroring function maintains packet ordering of bridging frames between the inbound and outbound interfaces.

Using the LCM or an NMS, you can mirror a port, and select to mirror all packets by a port (if the port is operating in half duplex).

To enable port mirroring on the ELS100-16TX:

1. Connect a network analyzer to the port you want to use as the mirror port on the ELS100-16TX.
2. Using the LCM or NMS, select the mirror port and the port or range of ports you want to mirror. Also select to mirror the received packets (Rx) or transmitted packets (Tx) or both. You must select one of these options or port mirroring will not function.

For example, `mirror 2 6 Tx`

This will turn on mirroring for packets transmitted on port 2 and mirror them to port 6.

### 3.9 DISABLING MIRRORING

To turn off mirroring, at the LCM prompt:

1. Type `Mirror <PORT> off`

For example, `mirror 2 off`

### 3.10 DISPLAYING MIRRORING STATUS

To check the status of your current mirroring configuration, at the LCM prompt:

1. Type `mirror <PORT>`

The display could look like the following:

```
ELS100-16> mirror 2
```

```
Port Mirroring: Port 1 is mirroring Tx traffic
```

```
.
```

```
.
```

```
.
```

```
Port 16 mirroring off
```

**Note:** The `mirror` command will display the status of all ports, even if a specific port or range of ports is entered with the command.

To check the status for ports configured for mirroring:

1. Type **status <PORT>**

The display could look like the following:

```
ELS100-16 > status 1
```

```
Port 1 Status
```

Type/Speed:	100B-TX/100Mbps
Port Mirroring:	No
Duplex Mode:	Half Duplex
Bridging:	Transparent Bridging
Enabled/Disabled:	Enabled, Rip listening
Spanning Tree:	Forwarding
Trunking State:	Off
Pkts Transmitted:	1693
Pkts Received:	0
Carrier Losses:	1693
Total Collisions:	0
Excess Collisions:	0
RX Missed pkts:	0
RX Runt pkts:	0
RX FCS/Align Errs:	0
Internal TX Errs:	0

```
Type <CR> to display port 2 status...>
```

The following conditions can be displayed:

- Rx only — mirroring is enabled, but mirroring only packets received by the port.
- Tx only — mirroring is enabled, but mirroring only packets transmitted by the port.
- Rx and Tx — mirroring is enabled, mirroring both transmit and receive packets.
- No — mirroring is not enabled.

### 3.11 DEFINING AND DELETING WORKGROUPS

The ELS100-16TX allows you to define logical groups of associated ports (virtual workgroups) to provide a more efficient flow of traffic across your Ethernet network.

Virtual workgroups offer you the ability to limit broadcasts to logical domains within the network. Workgroup destinations are recognized by the ELS100-16TX and packets are routed directly to ports within the workgroup, eliminating the need to perform a general broadcast across each segment of the network to find specific host addresses.

Figure 3-3 shows an ELS100-16TX that has been programmed to identify workgroups A and B. Workgroup A uses ports 3 through 5, 13 and 16 and workgroup B uses ports 7, 11 and 16. Port 16 connects a segment that contains both workgroup A and workgroup B hosts.

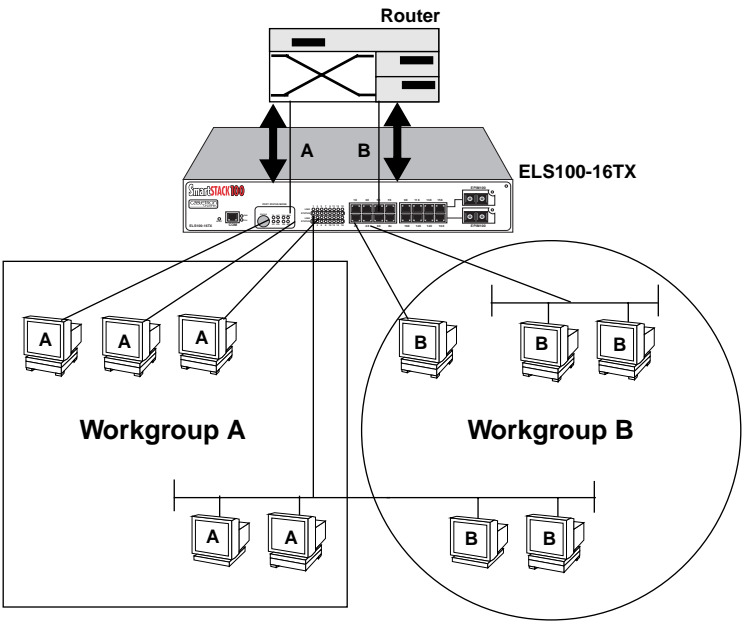


Figure 3-3. Defining Virtual Workgroups

The LCM commands used to create the previous configuration are as follows:

1. To create workgroup A on ports 3, 4, 5, 13, and 16:

```
ESL10-26 > workgroup A 3-5,13,16
```

LCM responds with the following display:

```
Name: a  
Ports: 3, 4, 5, 13, 16  
Info: All
```

2. To create workgroup B on ports 7, 11, and 16:

```
ESL10-26 > workgroup B 7,11,16
```

LCM responds with the following display:

```
Name: b  
Ports: 7, 11, 16  
Info: All
```

Port 16 has been assigned to a segment that includes nodes that belong to workgroup A and workgroup B. Port 13 connects workgroup A to the router and port 16 connects workgroup B to the router.

In the above example, both displays show that all broadcasts will remain with the workgroup.

Use the LCM command, *workgroup*, to create, modify, and delete virtual workgroups. The full syntax of the command is as follows:

```
workgroup [NAME [{delete | PORT-RANGE [INFO]}]]
```

To display all of the workgroups defined by the ELS100-16TX, at the LCM prompt:

1. Type **workgroup**

To display information about a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME`

To create or modify a workgroup, at the LCM prompt:

1. Type `workgroup NAME PORT-RANGE INFO`

To delete a workgroup, at the LCM prompt:

1. Type `workgroup NAME delete`

To create or modify the port list for a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME PORT-RANGE`

To display the network classification of a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME INFO`

## 3.12 ASSIGNING A COMMUNITY NAME

A community name is similar to a password. You use the same steps to assign a new community name or to change an existing community name. You can then enter a community name to perform any SNMP *sets*. The default password is *public* the first time you access the device.

To assign a community name, at the LCM prompt:

1. Type `community`
2. Enter the old community name.
3. If one has not been assigned, `public` is the default name.
4. Enter the new community name.



5. LCM prompts you to verify the new community name by retyping it.
6. Retype the new community name.

### 3.13 CONFIGURING BROADCAST/MULTICAST STORM PROTECTION

The ELS100-16TX provides automatic protection against broadcast/multicast storms. Multicast storms are excessive broadcasts to all ports, typically caused by a malfunctioning device. They can result in severe network performance problems, including causing the network to crash.

To protect against broadcast/multicast storms, you must define an acceptable rate for multicast traffic across a port. In many ways, this feature is similar to filtering.

Each ELS100-16TX port can be individually configured for automatic multicast storm protection. You define what level of multicasts the ELS100-16TX will recognize as a multicast storm by specifying the number of multicast packets that can be transmitted within a given time period.

**Note:** *LCM does not allow you to configure for multicast storm protection. You must use an SNMP-based NMS. See the documentation that came with your NMS for configuration instructions.*

For example, if you configure ELS100-16TX to transmit onto Port 3 no more than five multicasts per 60 seconds, any multicasts destined for Port 3 are discarded after the first five multicasts. After 60 seconds have elapsed, another five multicasts to Port 3 will be allowed. This maintains an effective maximum rate of five multicast packets per minute.

The two Management Information Base (MIB) variables for configuring multicast storm protection are:

- `kxifTxStormCnt` – specifies the maximum number of multicasts that can be broadcast within the given time.
- `kxiTxStormTime` – specifies the period of time that the maximum number of multicasts can be broadcasted.

Refer to the ELS100-16TX Release Notes for a complete listing and description of MIB variables.

### 3.14 MODIFYING MIB VARIABLES

Specific instructions for controlling ELS100-16TX operations, modifying parameters, and so on, depend on the NMS you are using. This manual provides instructions for using LCM commands. However, LCM commands do not exist for all configuration options. You may need to modify your configuration using an NMS.

This section provides several common MIB variables you may want to change. Refer to the ELS100-16TX Release Notes for a complete listing and description of MIB variables.

Each variable is first described in words, and is then identified in MIB form, for example, `kxadminGetPass` – `{kxadmin 3}`. The DisplayString line shows the range of values that can be used for the given parameter. In each case, the DisplayString is a string of ASCII characters.

### 3.15 SYSTEM CONTACT

The system contact parameter identifies the contact person who is responsible for operating the ELS100-16TX. Typically, this parameter includes the person's name, company or division name, and telephone number.

```
sysContact - {system 4}
DisplayString (SIZE (0..255))
```

## **3.16 SYSTEM NAME**

The system name is a name assigned to the ELS100-16TX by the network administrator. By convention, the system name is the fully qualified domain name. (This name then becomes the LCM prompt.)

```
sysName - {system 5}  
DisplayString (SIZE (0..255))
```

### **3.16.1 System Location**

The system location identifies the physical location of the ELS100-16TX.

```
sysLocation - {system 6}  
DisplayString (SIZE (0..255))
```

### **3.16.2 Community Names**

The set community name variable (from the Cabletron proprietary MIB), must be initialized with the correct community name passwords.

All requests from any SNMP manager contain a community name field. For set requests, the community name must match the set password; otherwise, the request will be rejected by the ELS100-16TX. For get requests, the community name must match either the set or the get community name.

## Set Community Name

The set community name variable (kxadminAnyPass) and get community name variable (kxadminGetPass) must be set to the value of the community name used by the SNMP manager for performing either set or get operations. A zero length community name means that any community name is acceptable.

```
kxadminAnyPass - {kxadmin 2}
DisplayString (SIZE (0..24))

kxadminGetPass - {kxadmin 2}
DisplayString (SIZE (0..24))
```

### 3.16.3 Aging Parameter

Dynamic (learned) addresses are automatically deleted from the ELS100-16TX Bridge Address Table after a certain length of time. The aging time default is five minutes, as set by the IEEE 802.1d standard. However, you can change the aging parameter with the MIB variable dot1dTpAgingTime.

The ELS100-16TX continually compares the actual age of each dynamic address against the age specified by the dot1dTpAgingTime parameter, and deletes any addresses that are older than the age specified (or older than five minutes if you are using the default). Typically, there is no need to set the aging time to a very small number because the ELS100-16TX Bridge Address Table supports 8192 addresses.

## **CHAPTER 4**

### **MONITORING AND MANAGING YOUR ELS100-16TX**

Monitoring the ELS100-16TX consists of collecting and analyzing statistics and system status information.

You can use the Select button on the front panel of the ELS100-16TX to monitor segment status on any of the Ethernet ports. Refer to Section 2.1 for a description of the segment status options.

Basic management of the ELS100-16TX consists of disabling or enabling Ethernet ports, changing subnet masks, setting the community name for the ELS100-16TX, and changing the baud rate for your Local Console Manager (LCM) connection.

#### **4.1 ELS100-16TX MANAGEMENT TOOLS**

LCM is a command-line interface built into the ELS100-16TX that enables you to monitor and manage the ELS100-16TX through the out-of-band RS232C connection attached to any non-intelligent terminal. You can also use one of the following Cabletron Systems Network Management Stations (NMSs), or a standard SNMP-based NMS to manage the ELS100-16TX:

- SPECTRUM
- SPMA
- SPEL
- Any SNMP-based NMS

#### **4.2 ELS100-16TX STATISTICS**

The ELS100-16TX gathers statistics that can help you build a comprehensive profile of the network traffic flow between each Local Area Network (LAN) you are connecting, as well as the network traffic flow between each Ethernet port on the ELS100-16TX.

ELS100-16TX statistics are divided into four groups:

- System statistics
- Ethernet port statistics
- Traffic analysis statistics
- SNMP statistics

You can use this information to analyze your overall network performance and to make configuration changes as necessary. For example, Ethernet port statistics can help you identify network devices that require high bandwidth, and therefore should be connected through a dedicated, rather than a shared, network connection. In addition, Ethernet port statistics can help you identify a network device that is the source of numerous multicast packets due to a possible malfunction.

## **4.2.1 Gathering Statistics**

For purposes of network management, managed objects must be identified. Creation of a managed object is achieved by placing its identifier, and a set of management information appropriate to its class, in the Management Information Database (MIB).

Using the MIB variables, you can obtain a detailed analysis of your network by combining statistics for each source network, destination network, and source and destination port. The ELS100-16TX Release Notes contain information on where to find the SNMP MIB variables you need to monitor and manage the ELS100-16TX.

## **4.2.2 System Statistics**

For each ELS100-16TX, the following system statistics are available:

- The number of seconds since the ELS100-16TX was last reset.

- The number of spanning tree topology changes that have occurred since the ELS100-16TX was last reset.
- The time since a topology change was last initiated.
- The physical location of the ELS100-16TX.
- The name and address of the contact person for the ELS100-16TX.
- The name of the ELS100-16TX.
- The current number of dynamic (learned) addresses.

**Note:** To check ELS100-16TX system status using LCM, see Section 4.3.

### 4.2.3 Ethernet Port Statistics

For each Ethernet port connection on the ELS100-16TX, a number of statistics are available. They can help you analyze both network activity and utilization, and in some cases, indicate faulty equipment or cabling.

**Note:** All statistics counters are cleared when the ELS100-16TX is reset or when the LCM `clearstat` command is used.

- The number of non-unicast (multicast and broadcast) and unicast packets received from the port.

The following statistics are available with SNMP:

- The number of bytes in the received packets.
- The number of bytes in the packets that were filtered.
- The number of bytes in the packets that were forwarded.
- The total number of packets transmitted to the LAN.

## 4.3 USING LCM TO CHECK ELS100-16TX STATUS

The LCM commands that enable you to quickly check on the status of the ELS100-16TX include:

- Status
- Address display
- Ipaddr
- Ident

These LCM commands are described in the sections that follow.

### 4.3.1 Displaying Status

The `status` command displays the status of the ELS100-16TX and automatically pages through the status of all of the Ethernet ports, pausing at each screen of information.

**Note:** *You can also use the `status` command to display status for individual Ethernet ports by typing `status` and specifying a port number.*

At the LCM prompt:

1. Type `status`

LCM displays the following type of information.



Software Currently Running: version xx.xx.xx software, Tue 08/23/94 15:0  
Next Bootstrap (1st bank): version xx.xx.xx software Tue 08/23/94 15:03:  
Power-up test failures: none  
System Up Time: 2:25:57  
Current Number of Learned Addresses: 133  
CPU utilization is light.

Port	RX Packets	TX Packets	Collisions	Erred Packets
1	0	1676	0	1676
2	6978	8	0	0
3	0	0	0	0
4	0	0	0	0
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
16	0	0	0	0

Type <CR> to display port 1 status...>

**If you do not want to view the status of each Ethernet port, use the Ctrl-C keys to return to the LCM prompt.**

ELS100-16> **status 1**

Port 1 Status

Type/Speed:	100B-TX/100Mbps
Port Mirroring:	No
Duplex Mode:	Half Duplex
Bridging:	Transparent Bridging
Enabled/Disabled:	Enabled, Rip listening
Spanning Tree:	Forwarding
Trunking State:	Off
Pkts Transmitted:	1693
Pkts Received:	0
Carrier Losses:	1693
Total Collisions:	0
Excess Collisions:	0
RX Missed pkts:	0
RX Runt pkts:	0
RX FCS/Align Errs:	0
Internal TX Errs:	0

Type <CR> to display port 2 status...>

If you do not want to view the status of port 2, use the Ctrl-C keys to return to the LCM prompt.

You can view the status for multiple of ports by typing `status` and indicating the range of port numbers, for example `status 2-6`.

### 4.3.2 Displaying MAC Addresses

The `addresses display` command displays all MAC addresses in the ELS100-16TX Bridge Address Table. The display includes:

- The MAC address
- Type of address, including:
  - Dynamic (learned)
  - Ethernet port (for the MAC address of an Ethernet port)
  - BPDU (the MAC address to which all BPDUs are directed)
  - Reserved (an address reserved by 802.1d, but not yet assigned)
  - All LANs (addresses reserved by 802.1d for network management)
- Port number
- Age (in seconds since a packet was last received from that address)

The display automatically pauses with each screen of information. Addresses are displayed in random order; for example, address 02:00:00:00:00:00 may appear after address 04:00:00:00:00:00.

The age will be the time since a packet was last received from that address.

To display all MAC addresses, at the LCM prompt:

1. Type `addresses display any`

LCM responds with a list of all MAC addresses, their associated ports, the type, age, and number of frames from and to that address.

Address	Type	Port	Age(secs)
08:00:20:02:3a:44	Learned	3	26

Enter <CR> to continue, Ctrl-C to exit:

If you do not specify `any`, only the learned addresses are displayed.

To display a specific address, at the LCM prompt:

1. Type `addresses display <MAC-ADDRESS>`

For example, if you typed, `addresses display 02:04:06:03:2a:43`, LCM would display the following information:

Address	Type	Port	Age(secs)
02:04:06:03:2a:43	Learned	5	21

You can display a range of addresses by using a net mask. This is helpful when determining the status associated with stations containing the same make of Ethernet network interface cards. At the LCM prompt:

1. Type `addresses display <MAC-ADDRESS> <NET-MASK>`

For example, to see all addresses that begin with 02:04:06, you would enter:

```
addresses display 02:04:06:00:00:00 ff:ff:ff:00:00:00
```

LCM would display:

```
Address          Type      Port   Age(secs)
02:04:06:03:2a:43  Learned    5       21
02:04:06:00:2a:67  Learned    4        1
02:04:06:a3:70:2b  Learned    6        0

Enter <CR> to continue, Ctrl-C to exit:
```

The `ipaddr` command displays the IP addresses, subnet masks, and MAC addresses of all ELS100-16TX ports. At the LCM prompt:

- 1. Type `ipaddr`

LCM displays the current IP address table, for example.

Port	IP Address	Address Mask	MAC Address
1	192.138.217.1	255.255.255.0	00:40:27:00:06:1f
2	0.0.0.0	255.0.0.0	00:40:27:00:06:c3
3	192.138.217.10	255.255.255.0	00:40:27:00:06:3e
4	0.0.0.0	255.0.0.0	00:40:27:00:03:7a
5	0.0.0.0	255.0.0.0	00:40:27:00:05:c7
6	192.138.217.20	255.255.255.0	00:40:27:00:04:4a
7	192.138.217.50	255.255.255.0	00:40:27:00:06:9e
8	192.138.217.30	255.255.255.0	00:40:27:00:04:b4

4.3.3 Displaying Manufacturing Information

The `ident` command identifies ELS100-16TX manufacturing information, including the part number and any power-up test codes and diagnostic data. To display the manufacturing information, at the LCM prompt:

- 1. Type `ident`

LCM displays the following type of information:

```
Part Number: 501-3000-002 X70002e4-0006891
Up-Link Module Part Number: 123-4567-891 X1234567-1234567
Power-up test codes: 00000000 00000000 00000000 00000000
Diagnostic data: 00000000 00000000 ffffffff ffffffff 00000000
                  00000000 ff006000 00000000
```

## **4.4 MANAGING THE ELS100-16TX**

Managing the ELS100-16TX consists of:

- Disabling and enabling Ethernet ports
- Changing a subnet mask
- Changing a community name
- Setting the baud rate of your terminal connection
- Setting a reboot time

You can use the Local Console Manager (LCM), any of the Cabletron Systems NMSs, or a standard SNMP-based NMS to manage the ELS100-16TX. Refer to Section 4.1.

## **4.5 USING LCM TO MANAGE THE ELS100-16TX**

The LCM commands that enable you to manage the ELS100-16TX include:

- Disable
- Enable
- Ipaddr
- Community
- Baud
- Reboot

These LCM commands are described in the sections that follow.

### 4.5.1 Disabling a Port

There can be times when you need to disable a specific Ethernet port, for example, after you have determined that there is faulty equipment. Disabling a port effectively stops all bridging functions for that port. Disabled ports do not accept SNMP packets, and therefore cannot communicate with an NMS.

To disable a port, or port range, at the LCM prompt:

1. Type `disable <PORT-RANGE>`

For example, `disable 7-9` would disable ports 7, 8, and 9.

LCM responds:

```
Port 7: Disabled
Port 8: Disabled
Port 9: Disabled
```

Once an Ethernet port is disabled, it will be disabled until you enable it again. Resetting the ELS100-16TX will not enable a port that has been disabled.

**Caution:** *If you disable the port through which someone is remotely managing the ELS100-16TX, that person will not be able to communicate with the ELS100-16TX. Use the LCM command `addresses display` to find the port number you are using to manage the ELS100-16TX.*

### 4.5.2 Enabling a Port

When you enable an Ethernet port that has been disabled, whatever bridging functions you had previously configured for that port are re-enabled.

To enable a port, or a range of ports, at the LCM prompt:

1. Type `enable <PORT-RANGE>`

For example, `enable 7-9` would enable ports 7, 8, and 9.

LCM responds:

```
Port 7: Enabled, Rip listening
Port 8: Enabled, Rip listening
Port 9: Enabled, Rip listening
```

**Note:** *Rip listening means that the ELS100-16TX is in listening mode only. No RIP packets are created.*

## noRIP Option

The Routing Information Protocol (RIP) is one of the protocols that allows the ELS100-16TX to build an accurate, current routing table. This table includes the networks it knows about, the next hop, and the number of hops to get there. RIP enables you to use an NMS to remotely manage the ELS100-16TX through a router.

The **noRIP** option allows you to turn off the routing information that builds the routing table. You would use this option when you are connecting network devices that do not support RIP.

### 4.5.3 Changing a Subnet Mask

You can optionally set the subnet mask for a port. A subnet mask is a 32-bit address mask used in IP to specify a particular subnet. If the subnet mask is 0.0.0.0, the ELS100-16TX automatically converts the displayed mask to the standard default, based on the port's IP address class. (Class A address masks are 255.0.0.0, Class B address masks are 255.255.0.0, Class C address masks are 255.255.255.0.)

To display IP addresses, subnet masks, and MAC addresses of all ports on the ELS100-16TX you are managing, at the LCM prompt:

1. Type `ipaddr`

LCM displays the current IP address table, for example:

Port	IP Address	Address Mask	MAC Address
1	192.138.217.1	255.255.255.0	00:40:27:00:06:1f
2	0.0.0.0	255.0.0.0	00:40:27:00:06:c3
3	192.138.217.10	255.255.255.0	00:40:27:00:06:3e
4	0.0.0.0	255.0.0.0	00:40:27:00:03:7a
5	0.0.0.0	255.0.0.0	00:40:27:00:05:c7
6	192.138.217.20	255.255.255.0	00:40:27:00:04:4a
7	192.138.217.50	255.255.255.0	00:40:27:00:06:9e

To change the subnet mask, at the LCM prompt:

1. Type `ipaddr <PORT-NUMBER> <IP ADDRESS> <SUBNET MASK>`

For example, `ipaddr 6 192.138.217.40 255.255.240.0` would set the subnet mask for port 6 to 255.255.240.0. LCM responds by redisplaying the address table.

**Note:** *When you change the subnet mask for a port, you must also enter the IP address for that port. Make sure you enter the IP address for the port correctly; whatever you enter becomes the IP address.*

To assign a new IP address, refer to Section 3.1.

### 4.5.4 Changing a Community Name

A community name is similar to a password. You use the same steps to assign a new community name or to change an existing community name. This sets the MIB variable `sxadminAnyPass`. You can then enter a community name to perform any SNMP *sets*.

To assign a community name, at the LCM prompt:

1. Type `community`
2. Enter the old community name.

If one has not been assigned, you do not need to enter anything. LCM prompts you for the new community name.



3. Enter the new community name.

LCM prompts you to verify the new community name by retyping it.

4. Retype the new community name.

### 4.5.5 Setting the Baud Rate

You can set the baud rate for your LCM console connection. The options for baud rate include:

- 1200
- 2400
- 4800
- 9600
- 19200

The default rate is 9600.

**Note:** *Make sure that the baud rate you set matches the baud rate setting for the terminal you are using.*

To display the current baud rate setting, at the LCM prompt:

1. Type `baud`

LCM responds:

```
Usage: baud [1200|2400|4800|9600|19200]
Baud rate is 4800.
```

To change the baud rate setting, at the LCM prompt:

1. Type `baud <baud rate>`

For example, `baud 9600` would set the baud rate to 9600.

LCM responds:

```
Baud rate is 9600.
```

### **4.5.6 Setting a Reboot Time**

You can enter the number of seconds the ELS100-16TX waits before rebooting. At the LCM prompt:

1. Type `reboot <time interval>`

For example, `reboot 60`

LCM responds:

```
Reboot pending in 59 seconds.
```

## CHAPTER 5

### ELS100-16TX DIAGNOSTICS AND TROUBLESHOOTING

The ELS100-16TX incorporates built-in diagnostic and testing capabilities which are convenient to use and cause minimal or no disruption to the rest of the operational network. These capabilities are effective for isolating problems within the ELS100-16TX unit. Built-in diagnostic capabilities include:

- System-wide power-up diagnostics, which are run every time the system is powered up or reset.

#### 5.1 POWER-UP DIAGNOSTICS

The ELS100-16TX performs an extensive set of diagnostic self-tests whenever any of the following events occur:

- Power-up
- Reset using the front panel Reset button (a hard reset)
- Reset via the NMS (a soft reset)
- Automatic reset in response to a non-recoverable failure

The power-up diagnostics test processors, memory, and other critical hardware components of the ELS100-16TX. All diagnostic software is stored in non-volatile memory.

##### 5.1.1 Power-up LED Sequence

When you power-up the ELS100-16TX, the following occurs:

1. The Power (Pwr) LED is on.
2. The CPU LED starts flashing. Two of the Port Status Mode LEDs are on.
3. After several seconds, the CPU LED will stay on and only one Port Status LED is lit. This indicates the power-up diagnostics sequence is complete.

**Note:** *If a critical component fails diagnostics, the CPU LED will turn off and the ELS100-16TX will attempt to reboot. If the CPU LED does not stay on, contact Cabletron Systems Global Call Center. Refer to Section 1.2.*

### 5.1.2 Specific Power-up Tests

The power-up diagnostic tests performed on the ELS100-16TX include:

- ROM checksum test
- Instruction/Data memory test
- FLASH checksum test
- NVRAM checksum test

### 5.1.3 Software Checksum Comparison

When the ELS100-16TX reboots, its operational software is verified by a checksum comparison before it is loaded. If the software fails the checksum test due to an interrupted new software distribution procedure, the ELS100-16TX will automatically use its backup version of software. A backup version of software is always stored in non-volatile memory.

The operational parameters of the ELS100-16TX software are also protected by a checksum comparison. When the ELS100-16TX reboots, if the operational parameters of the ELS100-16TX fail a checksum test due to a power failure in the midst of a previous update, the ELS100-16TX automatically uses its backup version of the parameters.

**Note:** *A backup version of the operational parameters is always stored in non-volatile memory before any update is attempted.*

### **5.1.4 Power-up Diagnostics Results**

After completion of the power-up diagnostic sequence, both the Power (Pwr) and CPU LEDs located on the front panel of the ELS100-16TX should be on.

## **5.2 RESPONSES TO FAILURES AT POWER-UP**

How the ELS100-16TX responds to failures detected during power-up depends on the seriousness of the failure. For example, it will operate if a non-critical component, such as the out-of-band management port, fails diagnostics. However, in the event of a critical failure, such as a failure of the main element processor, the ELS100-16TX will halt execution and will not boot to operational mode.

## **5.3 STATUS AND ACTIVITY INDICATORS**

The front panel of the ELS100-16TX includes LEDs that indicate the status or activity of various system components. Figure 5-1 shows the ELS100-16TX front panel LEDs and buttons. The LEDs and buttons are described in Tables 5-1 and 5-2.

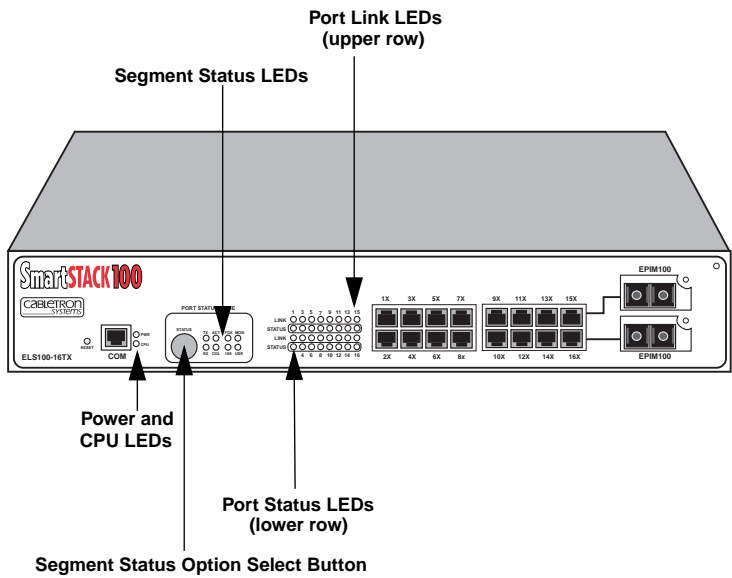


Figure 5-1. ELS100-16TX Front Panel LEDs

**Table 5-1. Meaning of ELS100-16TX LEDs**

LED	State	Meaning
Port Status Mode		
TX	On	Indicates port is transmitting a packet.
RX	On	Indicates port is receiving a packet.
ACT	On	Indicates port is transmitting or receiving.
COL	On	Indicates a collision on a port.
FDX	On	Port is operating in Full Duplex.
	Off	Port is operating in Half Duplex.
100	On	Port operating at 100 Mbps.
	Off	Port operating at 10 Mbps.
MON	On	Indicates the monitor port.
	Blink	Indicates the port(s) being monitored.
USR	On	Indicates that errored packets were received.
Link (Individual Ports)	On	Indicates the link is good.
	Off	Indicates there is no link.
Status (Individual Ports)	On/ Blink	Indicates you are monitoring the port for a selected segment status condition. This LED always indicates the selected status mode.
CPU	On	Indicates the ELS100-16TX is operational.
	Blinking	Indicates the ELS100-16TX is running power-up diagnostics.
	Off	Indicates the ELS100-16TX is non-operational.
Pwr	On	On – Indicates the ELS100-16TX is receiving power and the voltage is within the acceptable range.
	Off	Indicates the ELS100-16TX is not receiving power.

Table 5-2 describes the ELS100-16TX buttons.

**Table 5-2    Description of ELS100-16TX Buttons**

Button	Function
Status	Cycles through the Segment Status options (TX, RX, Act, Col, and Usr) for all ports. The lower port status LEDs of the ports you are monitoring are activated based on what function you chose with the Select button.
Reset	Restarts the ELS100-16TX.

**5.4 TROUBLESHOOTING**

This section lists several situations that could happen while using the ELS100-16TX, and suggests appropriate action. Because every situation is potentially unique, the corrective actions suggested here should be considered as guidelines only.

**5.5 ELS100-16TX DOES NOT POWER UP**

If your ELS100-16TX does not power up, check each one of the following:

- Make sure the power source is operational.
- Make sure the power cord is securely connected.

If the ELS100-16TX still does not power up, contact Cabletron Systems Global Call Center. Refer to Section 1.2 for more information.



### **5.5.1 Connectivity Problems**

- Check for LED abnormalities.
- Check port status using LCM.
- Check for loose port connections.
- Check to see if the number of carrier losses is increasing using LCM. This indicates that the connection is suspect.
- Check to see if the number of total collisions has dramatically increased using LCM.

### **5.5.2 ELS100-16TX Has Rebooted**

- Use the LCM `ident` command to check the ELS100-16TX diagnostic codes. Write down these codes exactly as they appear and call your authorized Cabletron Systems representative.

### **5.5.3 ELS100-16TX Does Not Respond to NMS**

- Check the port status using LCM.
- Check to see if the Spanning Tree topology is stable using LCM.
- Check that a pathway to the ELS100-16TX exists.
- Verify the ELS100-16TX IP address using LCM.



## **APPENDIX A**

### **TECHNICAL SPECIFICATIONS**

#### **A.1 ELS100-16TX SPECIFICATIONS**

##### **Physical**

Height	2.55 in (6.48 cm)
Width	17 in (43.18 cm)
Depth	15.5 in (39.4 cm)
Weight	9 lb (4.1 kg)

##### **Electrical**

Input voltage	Auto-ranging from 100–120, 200–240 Vac
Frequency	50/60 Hz
AC power consumption	80 watts

##### **Connector Ports**

- 16 RJ45 Ethernet ports (MDI-X)
- 1 RS232C port for Local Console Manager (LCM)
- 2 slots for optional Ethernet Port Interface Module

##### **Environmental**

Operating temperature	5° to 40° C (41° to 104° F)
Storage temperature	-30° to 73° C (-22 ° to 164° F)
Operating relative humidity	5% to 90% (non-condensing)

## **Diagnostic LEDs**

Individual port link status

Individual port segment status

Segment status, specifying one of the following:

- Transmit activity
- Receive activity
- Both Transmit and Receive activity
- Collision
- 100 (Mbps)
- Duplex
- MON (monitor)
- User-defined

CPU

Power (PWR)

## **Standard Support**

- IEEE 802.1 Part D
- IEEE802.2 (Logical Link Control)
- IEEE 802.3 (CSMA/CD, 10BASE-T) Ethernet
- Transparent Bridging with Spanning Tree
- Ethernet Version 2
- EIA RS232C (DTE-to-DCE Interface Specification)
- EIA RS-310-C (Rack-mount Specification)

## Address Table Size

8,192 dynamic entries

## Management Support

- MIB II, 802.1d, 802.3, and Cabletron Enterprise MIB
- Cabletron Systems Local Console Manager (LCM)
- Any SNMP-based network management system

## Regulatory Compliance

Safety	UL 1950, CSA C22.2 No. 950, EN 60950, IEC 950 and 73/23/EEC
Electromagnetic Compatibility	FCC Part 15, EN 55022, EN 50082-1, 89/336/EEC, CSA C108.8, VCCI V-3

## A.2 SERIAL CABLE PIN ASSIGNMENTS

For a PC running a Windows terminal connected to the RS232C Network Management Port on the front panel of the ELS100-16TX, the following serial cable pin assignments (Tables A-1 and A-2) are required to manage the ELS100-16TX using the Local Console Manager (LCM).

Table A-1. DB25 Pin Assignments

ELS100-16TX RJ45 (female)	DB25-pin (female)
Pin 1 (Tx)	Pin 3
Pin 4 (Rx)	Pin 2
Pin 5 (GND)	Pin 7

Table A-2. DB9 Pin Assignments

ELS100-16TX RJ45 (female)	DB9 pin (female)
Pin 1 (Rx)	Pin 2
Pin 4 (Tx)	Pin 3
Pin 5 (GND)	Pin 5

A.3 100BASE-T PIN ASSIGNMENTS

An Ethernet twisted-pair link segment requires two pairs of wires. Each wire pair is identified by solid and striped colored wires. For example, one wire in the pair might be red and the other wire, red with white stripes.

Connectors

Refer to the diagram below and note how the pins are numbered. Be sure to hold the connectors in the same orientation when connecting the wires to the pins.

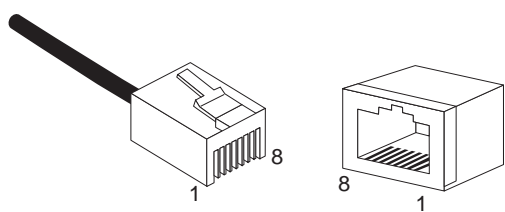


Figure A-1. Connector Pin Numbers

Each twisted-pair link segment must have a male connector attached to both ends. According to the 100BASE-T specification, pins 1 and 2 on the connector are used for receiving data; pins 3 and 6 are used for transmitting data, as shown in Table A-3.

**Table A-3. 100BASE-T Pin Assignments**

Pin	Assignment <sup>a</sup>
1	Rx+
2	Rx-
3	Tx+
6	Tx-

a. The “+” and “-” signs are used to represent the polarity of the two wires that make up each wire pair.

## A.4 STRAIGHT-THROUGH WIRING

If the twisted-pair link segment is to join two ports on a switch, and only one of the ports has an internal crossover, the two pairs of wires must be straight-through, as shown in Table A-4.

**Table A-4. Straight-Through RJ45 Pin Assignments**

ELS100-16TX (Crossed)	Device (Not Crossed)
1 (Rx+)	1 (Tx+)
2 (Rx-)	2 (Tx-)
3 (Tx+)	3 (Rx+)
6 (Tx-)	6 (Rx-)

## A.5 CROSSOVER WIRING

Two ELS100-16TXs can communicate only if the transmitter on one unit is connected to the receiver on the other unit. This reversal, or crossover function, can be implemented either in the wiring or in the device itself. When connecting ELS100-16TXs, a crossover must be implemented in the wiring. Refer to Table A-5 for crossover pin assignments.

Table A-5. Crossover RJ45 Pin Assignments

ELS100-16TX	ELS100-16TX
1 (Rx+)	3 (Tx+)
2 (Rx-)	6 (Tx-)
3 (Tx+)	1 (Rx+)
6 (Tx-)	2 (Rx-)

A.6 THE 5 - 4 - 3 RULE

Between any two nodes (i.e., PCs or other stations) on the network, there can be:

- Up to five segments in series
- Up to four repeaters or multi-port hubs
- Up to three populated segments (that is, segments attached to two or more PCs). The remaining two segments are unpopulated; these are known as inter-repeater links or IRLs. This distinction between populated and unpopulated segments is significant for coax networks only.

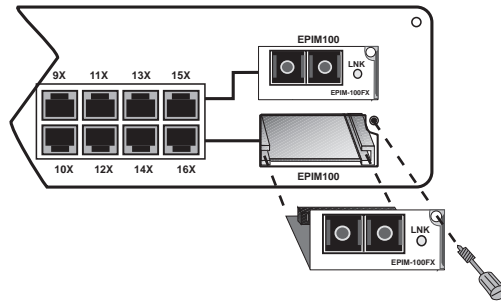
***Note:** This rule is completely consistent with the IEEE 802.3 specification, and is meant only to summarize the configuration specification.*

A.7 EPIM-100FX SPECIFICATIONS

The ELS100-16TX uses a Ethernet Port Interface Module (EPIM) to provide front panel cable connections. FEPIMs are user-installable. See Section 2.2, **Installing an EPIM**.

The EPIM-100FX shown in Figure A-2 supports Multimode Fiber Optic cabling. The EPIM-100FX is equipped with an SC style connector.





**Figure A-2. EPIM-100FX**

Specifications for the EPIM-100FX are listed in Table A-6. The transmitter power levels and receive sensitivity levels listed are peak power levels after optical overshoot. A peak power meter must be used to correctly compare the values given above to those measured on any particular port. If power levels are being measured with an average power meter, add 3 dBm to the measurement to compare the measured values to the values listed below.

**Table A-6. Transmitter Power**

Cable Type	Worst Case Budget	Typical Budget
50/125 $\mu\text{m}$ fiber	6.0 dB	9.0 dB
62.5/125 $\mu\text{m}$ fiber	9.0 dB	12.0 dB
100/140 $\mu\text{m}$ fiber	15.0 dB	18.0 dB



## APPENDIX B

### GLOSSARY

**address**

A set of characters that uniquely identifies a station, peripheral device, node, or other unit in a network.

**address table**

A database of device addresses and their associated ports maintained by a switch or bridge for use in making data packet forwarding and filtering decisions.

**agent**

Network management software that runs within a managed network device.

**alarm**

See *trap*.

**ANSI**

American National Standards Institute – One of several organizations that establishes standards that apply to internetworking.

**ARP**

Address Resolution Protocol – An auxiliary protocol of the IP layer used to perform dynamic address translation between MAC addresses and internet addresses. Binds IP addresses to specific MAC addresses.

**attenuation**

The amount of power (or light) lost as power travels through a medium from the transmitter to the receiver. Difference between transmitted and received power, in decibels (dB).

**AUI (attachment unit interface)**

A standard connector type used for Ethernet connections.

**backbone**

The major, central transmission path for a network. A backbone usually handles high-volume, high-density traffic. Typically a backbone connects various LANs into an integrated network.

**bandwidth**

A measure of the amount of traffic a given medium can handle at one time: The communications capacity (measured in bits per second), of a transmission line or of a specific path through a network. Greater bandwidth generally means more information can be sent through a circuit during any given period of time.

**BPDU (bridge protocol data unit)**

A data unit transmitted as part of the IEEE 802.1d Spanning Tree Protocol. The exchange of BPDUs allows bridges within a network to logically configure the network as a single spanning tree.

**bps (bits per second)**

The basic unit of data communications rate measurement.

**bridge**

An intelligent, protocol independent device used to connect similar or dissimilar LANs.

**bursty**

Adjective used to describe sporadic heavy volumes of network traffic (e.g., bursty traffic).

**bypass**

Optical or electronic isolation of a station from the network. A bypass situation typically occurs as a result of a station failure or shutdown; the bypass allows the network to function normally, except for the absence of the missing station.

**concentrator**

A device that provides attachment points for stations that are not connected to the ELS100-16TX. The concentrator is connected directly to the network; the stations connect to the concentrator.

**congestion**

A condition where a portion of the network is overloaded with more data than can be transmitted in the desired time period.

**CSMA/CD (carrier-sense multiple access with collision detection)**

A channel access (contention) method that requires each station to wait for an idle channel before transmitting. In addition, stations are able to detect overlapping transmissions (collisions) and retransmit in the event of a data collision.

**data link layer**

Layer 2 in the OSI model. Defines frame construction, addressing, error detection, and other services to higher layers.

**datagram**

Abbreviated and connectionless single-packet message sent from one station to another.

**data rate (or speed)**

The maximum number of bits of information that can be transmitted per second.

**downstream**

Refers to the relative position of a station in a network to another station in the same network. A station is downstream from another station if it receives data after the other station receives data.

**dynamic address**

An address “learned” by the ELS100-16TX, as opposed to addresses that are manually entered into the Bridge Address Table. The ELS100-16TX “learns” addresses by reading them from the data packets it processes.

**EIA (Electronic Industries Association)**

Organization that sets standards for electrical interfaces (connectors).

**encapsulation**

A method for moving messages across networks that use different types of protocols. The message is encapsulated (rather than translated), so it can move across a network that otherwise could not understand its protocol. Encapsulating bridges and switches generally use proprietary encapsulation schemes.

**encode**

To translate data into a series of electrical or optical pulses that can travel efficiently over a cable or other medium.

**entity**

An active element within an Open Systems Interconnection (OSI) network layer or sublayer.

**extended LAN**

A collection of LANs interconnected by protocol-independent bridges or switches.

**filtering rate**

A measure (in packets per second) of the ELS100-16TX's efficiency in examining each frame, comparing it with an address table, and then deciding whether to discard the frame or forward it.

**forwarding rate**

The rate (in packets per second) at which the ELS100-16TX can receive a stream of packets from one network segment, complete all processing, and transmit the packets to another network segment.

**frame**

A data message that includes a source address, destination address, data, frame check sequence (FCS), and control information.

**full wire speed**

Refers to packet forwarding at the maximum rate at which data can be transmitted on a given LAN.

**ICMP (Internet control message protocol)**

An auxiliary protocol of IP used to convey advice and error messages about events in the IP layer.

**IEEE (Institute of Electrical and Electronic Engineers)**

International professional society which issues networking and other standards. The IEEE created the 802 family of LAN standards.

**IEEE 802.2**

The data link layer standard; used with IEEE 802.3, 802.4, 802.5, and other LAN/WAN protocols.

**IEEE 802.3**

The physical layer standard that uses the CSMA/CD access method on a bus topology LAN.

**IEEE 802.6**

Standard for metropolitan area networks (MANs) currently under development.

**initialization**

Transition of a device or network from startup state to operational state.

**intelligent bridge/switch**

A bridge/switch that is able to identify source and destination addresses.

**internet**

A large communications infrastructure composed of wide and local area networks. A generic reference to a network built using internetworking technology.

**Internet**

A large collection of connected networks which use TCP/IP. (Also referred to as the DARPA Internet, NSF/DARPA Internet or the Federal Research Internet.)

**internetworking**

The linking of one or more networks to facilitate communication across networks.

**interoperability**

The ability of equipment from multiple vendors to exchange information using standardized protocols.

**IP (Internet protocol)**

IP is the basic datagram protocol used at the network layer of the TCP/IP stack.

**ISO (International Standards Organization)**

An organization that creates, controls and publishes standards.

**jitter**

Clocking deviation on a network.

**Kbps (kilobits per second)**

1,000 bits per second.

**LAN (local area network)**

A network that interconnects a variety of devices (computers, printers, servers, and so on), within a limited geographical area. A LAN typically connects devices within a building or campus.

**link-loss budget**

Each connection (link) in an optical system results in a certain amount of signal strength loss. Link-loss budget refers to the process of calculating link loss for the entire system. If the total link loss exceeds a certain limit, the system will not function.

**LLC (logical link control)**

A part of the data link layer of the OSI model that defines the transmission of a frame of data between two stations (with no intermediate switching nodes).

**local traffic**

Traffic within a given network segment.



**MAC (media access control)**

The data link layer sublayer responsible for scheduling, transmitting, and receiving data on a shared medium local area network.

**mask**

Specified a subset of a larger set of data to be included for comparison and analysis. For example, in switch filtering, a mask might be configured to include only the first four address bits as the basis for filtering decisions.

**Mbps (megabits per second)**

1 million bits per second.

**MIB (management information base)**

A collection of objects unique to a specific device that can be accessed via a network management protocol. The ELS100-16TX has its own MIB.

**multicast**

Packets destined for more than one address.

**multicast (broadcast) storm**

Excessive multicast packet traffic, typically generated by a faulty device. Multicast storms can cause severe network performance problems.

**network**

Interconnected computer systems, terminals, and data communication facilities. A network must have at least three endpoints and may have any number of links and nodes.

**node**

Any device connected to a communication network, for example a computer, workstation, printer, server, concentrator, bridge, and switch.

**OSI (Open Systems Interconnection)**

Refers to the OSI reference model, a logical structure for network operations. OSI is the internationally accepted framework of standards for internetwork communication.

**packet**

A group of bits including data and control elements arranged in a specific format that are transmitted and switched as a composite whole. Control elements include a source address, destination address, frame control and status indicators, and a Frame Check Sequence (FCS).

**PDU (protocol data unit)**

The portion of a datagram that contains the data associated with a particular protocol.

**peer-to-peer**

Term used to describe data transmission between entities in the same sublayer of the OSI model.

**physical layer**

Layer 1 of the OSI model. Defines and handles the electrical and physical connections between systems.

**power budget**

The difference between transmit power and receiver sensitivity, including any safety margins.

**PPP (point-to-point protocol)**

A protocol for transmitting datagrams (IP or MAC packets) over a serial point-to-point link (e.g., the out-of-band management port).

**pps (packets per second)**

Unit of measure used to express packet data throughput. 18 pps is approximately equal to 9600 bps.

**propagation delay**

The time it takes for a signal to travel across a network.

**protocol**

A set of rules used by computers and related devices to communicate with each other.

**protocol suite**

A group of protocols related to a common framework.

**RARP (reverse address resolution protocol)**

A protocol that binds MAC addresses to specific IP addresses.

**RISC (Reduced Instruction Set Computing)**

A data processing technology in which functions are performed using the least possible number of instructions to yield very fast processing.

**segment**

When two or more networks are interconnected to form an internetwork, the original networks are referred to as segments.

**service**

A set of functions offered to a user by a provider.

**SNMP (simple network management protocol)**

A TCP/IP protocol for communication between a network management system and a network device.

**source address filtering**

A switch or bridge function that forwards or rejects data, depending on the data's source address.

**static address**

Addresses manually entered into the Bridge Address Table (as opposed to those automatically learned by the ELS100-16TX).

**STP (spanning tree protocol)**

A protocol that ensures that only one path will be used between two devices; prevents active loops (multiple paths to devices), by closing redundant paths. With STP operating, a redundant link serves as a backup link only if a normal path fails.

**switch**

An intelligent, protocol independent device used to connect similar or dissimilar LANs.

**symbol**

The smallest signaling element used by the MAC sublayer. Each symbol corresponds to a specific sequence of code bits to be transmitted by the physical layer.

**synchronous transmission**

A transmission technique in which an uninterrupted block of data is transmitted, using no redundant information such as stop and start bits to identify the beginning and end of a unit of data.

**TCP/IP (transmission control protocol/Internet protocol)**

Internetworking protocols sometimes referred to as the Internet suite of protocols.

**topology**

The arrangement of devices and cable paths that make up a network.

**translating bridge**

A bridge that can pass data between LANs that use different protocols.

**translation**

Modification of data packets from one type of network so they can be used on a different type of network (e.g., Ethernet to FDDI translation).

**trap**

Alarm; notification of an event that has occurred on a network. Some alarms require intervention or action by the network administrator; some are merely informational.

**UDP (user datagram protocol)**

A TCP/IP protocol for the connectionless transport layer.

**upstream**

Refers to the relative position of a station in a network to another station in the same network. A station is upstream from its neighbor if it receives data before its neighbor receives the data.

**WAN (wide area network)**

A communication network that spans a large geographic area.

